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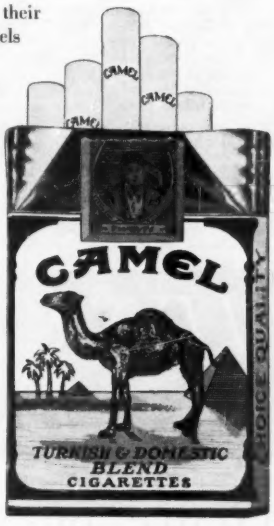

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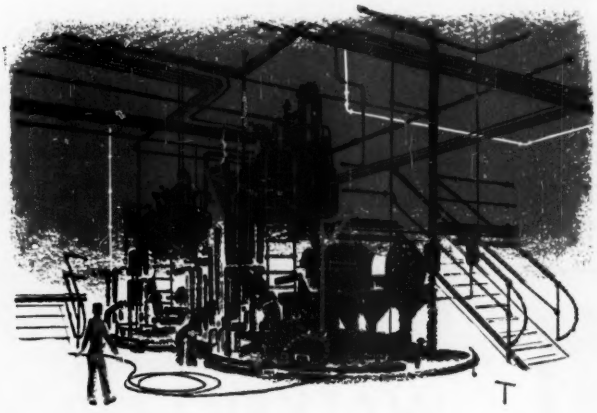

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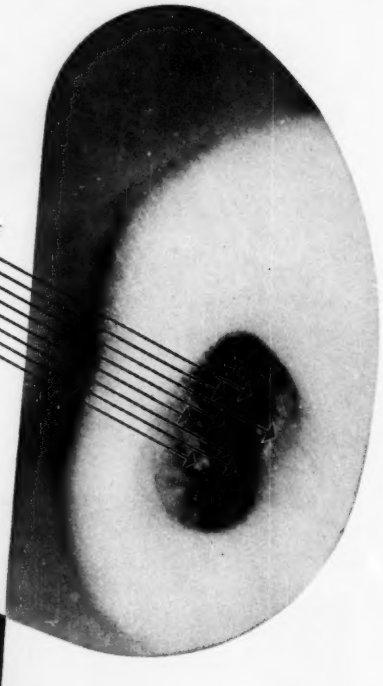

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THE AUSCULTATORY SIGNS IN RHEUMATIC VALVULAR DISEASE*

A Phonocardiographic Correlation

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MANILA, PHILIPPINE ISLANDS, AND BOSTON, MASSACHUSETTS

JONES[1] emphasized the significance of carditis, particularly valvular involvement, as the most valuable single criterion in the diagnosis of rheumatic fever. Therefore, auscultation is naturally one of the most important diagnostic procedures in this disease. Although the auscultatory findings are often fairly characteristic, there are many cases in which interpretation is extremely difficult. On the one hand, the acoustic signs may be inconclusive, and on the other, the inherent and individual limitations in the human hearing mechanism may produce inadequate auscultatory perception, with resulting erroneous interpretation.

The value of auscultation in valvular disease, which has been apparent since Laënnec[2] first introduced the stethoscope in 1819, has become even more evident since correlated graphic methods of study brought about better understanding, improved auscultatory technic and more accurate interpretation of acoustic phenomena. In 1941 Rappaport and Sprague[3] emphasized the peculiarities of the human hearing mechanism and its limitations in clinical auscultation. Some of the more important characteristics of the hearing mechanism are the greater sensitivity of the human ear to changes in frequency than to changes in intensity, as well as to frequency variations in the upper end of the auscultatory band than to those in the lower region, and the fatiguing effect on the ear produced by intense vibrations to the extent of completely masking adjacent vibrations of lesser intensity. The same authors have also discussed the optimal characteristics for phonocardiography and the deficiencies of previous procedures in the registration of sounds and murmurs. Today, with a knowledge of these acoustic principles and with the use of these phonocardiographic technics, one can achieve satisfactory correlation between auscultatory perception and phonocardiographic registration. It is from such a correlation that clearer understanding and more accurate interpretation of auscultatory signs are attained, often leading to the solution of diagnostic problems in rheumatic heart disease.

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MITRAL-VALVE DISEASE

Knowledge of the auscultatory signs of mitral-valve disease, particularly of stenosis, can be traced to the early days of auscultation.[4] Elaborate descriptions were first made by Williams[5] and Bouillaud,[6] the latter proposing the term "bruit de rappel." Gendrin[7] then introduced the concept of a presystolic murmur. However, Duroziez's[8] description in 1862 — "ffout-tatarou" — has been considered the classic auscultatory sign of mitral stenosis. The "ffout" corresponds to the presystolic crescendo murmur ending abruptly with the snapping first sound, the "tata" to the duplicated second sound, and the "rou" to the diastolic rumble. In general, phonocardiography has confirmed the original descriptions and interpretations[9] of the pioneer French investigators. Other authors, however, have added newer concepts that have modified several aspects of the original interpretations.

For a time the duplicated second sound was interpreted in various ways. Duroziez[8] and Gendrin[7] attributed it to asynchronous closure of the semilunar valves. Rouchès[10] introduced the term "claquement d'ouverture de la mitrale" — or opening snap of the mitral valve — to explain the second element of the duplicated second sound. A third sound coming close to the second sound can also produce a similar acoustic impression. Accurate differentiation of these various possibilities can now be made through simultaneously recorded heart sounds, jugular phlebogram and apex cardiogram (Fig. 1).

Simple splitting of the second sound shows the two elements with essentially the same intensity and coming close to each other within 0.07 second.[11] On the other hand, an opening snap occurs usually at least 0.08 second after the main valvular ele-

ments of the second sound, and coincides with the apex of the V wave of the jugular tracing and the O wave or incisura in the apex cardiogram. These time relations are obvious when one considers the

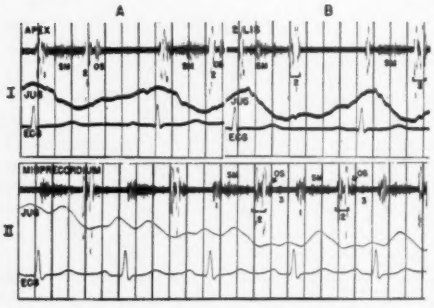

FIGURE 1. *Simultaneous Logarithmic Phonocardiograms, Jugular Phlebograms, and Electrocardiographic Lead 2 in 2 Cases of Rheumatic Mitral Stenosis and Regurgitation.*

In the upper tracings, taken on the same patient, the duplication of the second sound is due to the opening snap of the mitral valve, whereas over the pulmonic area (2 LIS) the duplication is due to an ordinary splitting of the second sound. (Note the greater interval separating the two elements of the duplication in the opening snap and the obvious difference in graphic characteristics.) The lower tracing in another case, recorded over the midprecordium, shows a split second sound conducted from the pulmonic area and an opening snap and third sound conducted from the apex.

effect of the opening of the auriculoventricular valves upon the venous pulse wave and the linear tracing over the cardiac apex.[12, 13] Finally, the third sound occurs still later in diastole at the time of the initial rapid filling of the ventricle. It coincides with the rapid inflow wave in the apex cardiogram and during the downslope of the V wave of the jugular tracing.

Phonocardiography offers other clues that may permit differentiation of these diastolic phenomena by clinical auscultation alone. These clues are based upon their graphic characteristics. Because of its high frequency, an opening snap reveals a dry and high-pitched quality, whereas a third sound is dull and low pitched. There is occasionally some difficulty in distinguishing an opening snap from a split second sound. Better audibility over the apex as a rule favors an opening snap, and a reduplicated second sound is often better heard over the pulmonic area. However, Margolies and Wolferth[12] have shown that not infrequently an opening snap may be well heard over the pulmonic area. In such circumstances the interval between the two elements of the duplicated second sound may furnish some clue to the true nature of the duplication. In case of doubt, the phonocardiogram may give the conclusive answer. Accurate evaluation of the cause of the duplication of the second sound is important because of the diagnostic significance of an opening snap.[13, 14] Furthermore, the opening snap is one of the few indications of mitral stenosis that persist even when murmurs may become equivocal or absent, as during auricular fibrillation or congestive failure, or both.

The diastolic rumble generally starts after the fourth component of the second sound,[15] or the opening snap when this is present, and persists for a variable duration in diastole. It becomes more intense at the time of the third sound owing to the more rapid inflow of blood into the ventricle. Subsequently, the murmur may gradually fade or may persist into presystole. The murmur may be intense, but its low frequency accounts for the difficulty often encountered in its detection by auscultation. Therefore, for adequate identification of this murmur, one should hold the open-bell chest piece lightly over the skin surface during auscultation and stethoscopic registration when the phonocardiographic technic is used (Fig. 2).

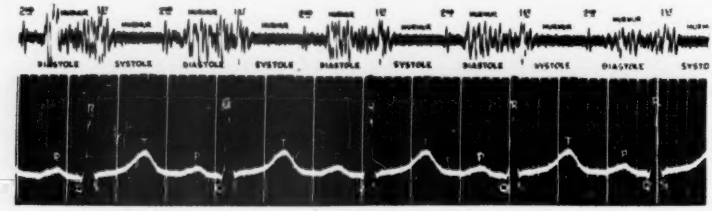

FIGURE 2. *Simultaneous Phonocardiogram at the Apex and Electrocardiographic Lead 2 in an Eight-Year-Old Boy with Rheumatic Mitral Stenosis and Regurgitation.*

This tracing illustrates the relatively low frequency diastolic-presystolic murmur of mitral stenosis. It also shows the variable configuration of the presystolic phase, from a typical crescendo ending with the first sound to a diminuendo with minimal intensity prior to the first sound.

The studies of Bland, Jones and White[16] have demonstrated that a diastolic rumble is not always indicative of mitral stenosis. They observed the murmur to disappear as cardiac size returned to normal. In such cases they attributed the murmur to dilatation of the left ventricle, which produced relative narrowing of the mitral orifice without organic damage to the mitral valve. In 1940 Taquini, Massell and Walsh[17] reported phonocardiographic studies in early rheumatic patients and noted diastolic phenomena giving rise to an acoustic diastolic rumble effect. More recently, Luisada and Montes[18] studied the phonocardiograms of 13 patients in whom a clinical diastolic rumble

Various maneuvers are commonly used to facilitate both auscultation and graphic registration of the diastolic rumble. Increasing the heart rate by exercise or medicinal means is a well known clinical procedure, especially if the patient is immediately placed in the left lateral decubitus position. Apparently, the increase in heart rate is the essential element in this procedure, for Levine and Harvey[20] observed the same result with the patient in the right lateral decubitus position. Another maneuver is described by Vedoya[21] after certain phonocardiographic observations he had previously noted. The procedure consists of forced expiration held for about 10 seconds followed by deep inspiration and

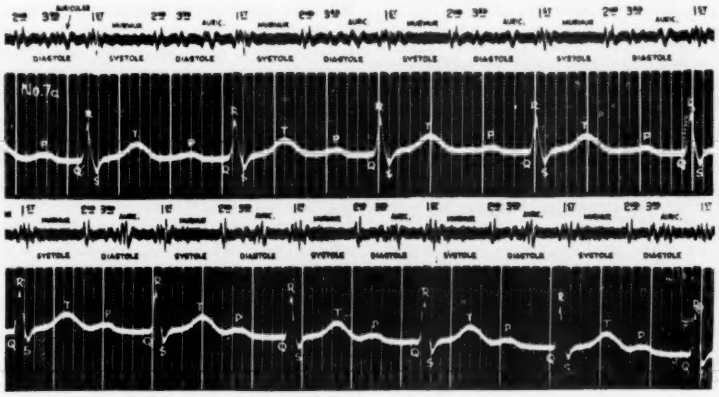

FIGURE 3. *Phonocardiogram at the Apex and Electrocardiographic Lead 2 in a Six-Year-Old-Boy with Rheumatic Mitral Insufficiency.*

Mitral stenosis was also suspected because of an apical diastolic rumble. The tracing shows that the rumble was an acoustic illusion produced by a merging of an accentuated third and an auricular sound when the heart rate was rapid and diastole short. In the earlier portion of the upper tracing, with a longer diastole, there is a distinct separation of the third and auricular sounds, whereas, in the later portions of the lower record, with a shorter diastole, these sounds meet and merge, to produce the auscultatory illusion of a diastolic rumble.

was described and found this to be due to combinations of a variety of acoustic phenomena. A summation of the third and auricular sounds during short diastole is probably the most confusing on auscultation because the acoustic effect may be identical to that of a diastolic rumble (Fig. 3). These observations stress the fact that not all auscultatory diastolic rumbles are really due to mitral obstruction, and that rumbles may be produced by left ventricular dilatation with intact mitral valves. Further support to the latter concept is the not infrequent finding that apical diastolic murmurs in nonrheumatic infants and children with cardiac enlargement may be due to a variety of other conditions.[19]

apnea, both phases done with closed nose and mouth. The rumble becomes more audible and recordable in the few cycles during the period of apnea, irrespective of changes in heart rate. In all such procedures the intensification of the diastolic rumble may be attributed to the sudden increase of blood flow into the ventricle.

The presystolic murmur is also considered of almost equal diagnostic significance in mitral stenosis as the opening snap; this is probably true in most cases. The murmur is clinically described as crescendo and terminating with the loud snapping first sound. That this crescendo character is not a constant finding has been shown by Johnston[22] and by Battro and Braun-Menendez.[23] In fact, the

murmur often fades before the occurrence of the first sound (Fig. 2). The acoustic crescendo effect is usually an auditory illusion because of its close proximity to the accentuated first sound.[24] Presystolic crescendo murmurs are occasionally encountered in conditions other than mitral stenosis,

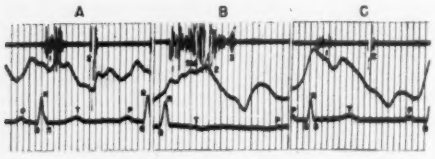

FIGURE 4. *Crescendo-Type First Sounds at the Apex Leading to an Auscultatory Illusion of a Presystolic Crescendo Murmur and an Incorrect Diagnosis of Mitral Stenosis.*

These tracings show no presystolic murmur at all. A *is a tracing in a case of aortic regurgitation,* B *one in a case of subaortic stenosis, and* C *one in a normal subject. In such configurations of the first sound, there may or may not be splitting of the sound complex.*

such as the Austin-Flint murmur in aortic regurgitation.

More recently, Alimurung, Rappaport and Sprague[25] described crescendo-type first sounds that were mistaken for presystolic murmurs, particularly when the first-sound complex was prolonged or split, or both. Under such circumstances, the loudest portion of the sound complex may be mistaken for the entire first sound, and the earlier elements of lesser intensity and with crescendo configuration interpreted as the presystolic crescendo murmur. This variation of the first sound was observed in cases of organic heart disease, aortic regurgitation and various types of congenital heart anomalies, as well as in healthy persons (Fig. 4). Although mitral stenosis was suspected, such a diagnosis was proved erroneous by the absence of any presystolic murmur in the phonocardiogram. These observations emphasize the caution that must be observed in interpreting what appear as short and unimpressive presystolic crescendo murmurs, particularly when there is no other evidence of mitral stenosis. Phonocardiographic procedures eliminate this source of error.

A loud and snapping first apical sound is another fairly common sign of mitral-valve disease. It may even be the first suggestion of fibrosis and early stenosis, unless there is some other factor that may account for its unusual loudness and quality. It is more significant when associated with an accentuated second pulmonic sound and evidence of left auricular enlargement. The mechanism of the loud first sound in mitral stenosis is still unknown, and, for that matter, the mechanism of the production of the normal first sound is not completely understood. Orías and Braun-Menendez[26] emphasized four important factors: the auricular, valvular, muscular and vascular. In recent experimental studies Luisada and Alimurung[27] could not always dissociate these factors and thus concluded that a combined musculovalvular mechanism has to be postulated, with the valvular factor probably playing the major role. Some observers[28] attribute the loud first sound in mitral stenosis to a prolongation of the peak of auricular systole that allows the auriculoventricular valves to become more widely separated at the time of ventricular contraction. It seems doubtful, however, that fibrous and rigid mitral valves can separate so much more as a result of the prolongation of auricular systole. Furthermore, the exact position of the auriculoventricular valves at the end of auricular contraction is still unknown. The convincing experiments of Henderson and Johnson[29] and Dean[30] indicate that the mitral-valve leaflets are actually almost completely closed at the end of auricular contraction.

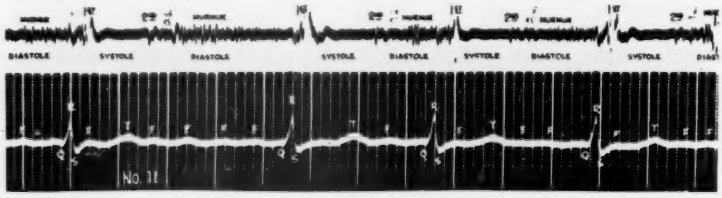

FIGURE 5. *Phonocardiogram at the Apex and Electrocardiographic Lead 2 in a Case of Mitral Stenosis and Auricular Fibrillation.*

The tracing shows an accentuated first sound, no systolic murmur, an opening snap and a diastolic murmur. Owing to the fibrillation, there is no presystolic accentuation of the diastolic murmur, which is better seen when diastole is prolonged. When diastole is short, the proximity of the accentuated first sound to the diastolic murmur may create an auscultatory illusion of a presystolic crescendo murmur.

Rytand[31] noted that the loud first sound in auricular fibrillation exhibited variations in intensity in the nonrheumatic subject but did not in the rheumatic patients with fibrillation. He therefore suspected that the fibrous and rigid state of the valve leaflets in mitral stenosis contributes significantly to altered sound production.

During auricular fibrillation certain changes in the foregoing acoustic signs occur (Fig. 5). The first sound remains intense, and its onset becomes more delayed than usual, as related to the start of the electrocardiographic QRS complex.[32, 33] The opening snap persists and may be the only clue to the diagnosis. This is because the diastolic-presystolic murmur may disappear, a variation also observed during congestive failure. In recent studies, Messer et al.[34] found that the interval between the onset of the valvular component of the second sound and the opening snap in auricular fibrillation depended in large measure on the preceding RR interval, with an average correlation coefficient of 0.7 to 0.9. They also noted that the opening snap may occur closer than 0.07 second to the valvular elements of the second sound, which emphasizes the importance of relating the duplicated second sound to the apex cardiogram for accurate interpretation of the nature of the duplication. Finally, the presystolic murmur disappears in auricular fibrillation, inasmuch as it is dependent upon auricular contraction, as first emphasized by Lewis.[35] What have been considered clinically as presystolic murmurs during auricular fibrillation have been shown by phonocardiography as acoustic illusions from various causes. Cossio and Berconsky[36] studied 15 patients with auricular fibrillation with clinical evidence of presystolic murmurs and found no such murmur in the phonocardiogram. Instead, they noted one of two things: a few vibrations or a low coarse wave preceding the valvular components of the first sound but occurring after the electrocardiographic Q wave. They interpreted the former as a short early systolic murmur preceding the first sound and the latter as due to the precordial impact of the cardiac apex during the initial phase of ventricular systole from delayed closure of the auriculoventricular valves in mitral stenosis. In most cases the presystolic acoustic impression is probably due to the proximity of the accentuated first sound to the diastolic rumble, which accounts for the observation that such an acoustic effect is more apparent when diastole is short. Another possibility is a crescendo-type first sound, as described above.

Although mitral stenosis gives rise to a variety of acoustic signs, mitral incompetence does not exhibit any truly distinctive signs. The intensity of the apical systolic murmur is probably the only clue to mitral-valve incompetence, particularly when there are other evidences of rheumatic fever or when a positive history of the disease is present. Evaluation of apical systolic murmurs is often extremely difficult, although Grade III to VI murmurs are generally regarded as organic in origin.[37] The murmur of mitral insufficiency is usually described as diminuendo after the first sound, often obscuring the latter, whereas the phonocardiogram shows the murmur to be of variable configuration (Fig. 6). It may have an initial crescendo followed by a longer decrescendo; it may be continuous or irregular; or it may even be simply a short, late systolic crescendo.

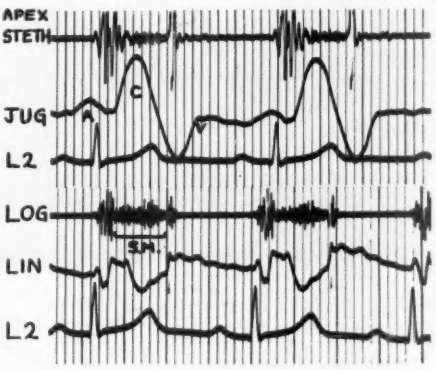

FIGURE 6. *Stethoscopic and Logarithmic Phonocardiograms over the Apex, with Simultaneous Jugular Phlebogram, Apex Cardiogram and Electrocardiographic Lead 2, in a Twenty-Year-Old Patient with Rheumatic Mitral Insufficiency. These tracings illustrate the variable configuration of the systolic murmur, though it is most often crescendo-decrescendo and occupies all of systole.*

Whether pure mitral insufficiency and pure mitral stenosis occur is an unsettled question. Some observers doubt the existence of pure mitral insufficiency to the extent of considering an apical systolic murmur among the signs of mitral stenosis.[38, 39] Experience of others, including post-mortem studies, clearly demonstrates that there can be pure mitral insufficiency. On the other hand, roentgenographic and electrokymographic studies[40, 41] indicate that regurgitation almost always accompanies stenosis, even in the absence of an apical systolic murmur. This is evidenced by left auricular expansion, which indicates reflux of blood into the left auricle during ventricular systole.

Aortic-Valve Disease

The aortic valve is also often involved in rheumatic heart disease. As a matter of fact, aortic regurgitation occurs more frequently than is generally appreciated. Quite often, the advanced cases with typical auscultatory and peripheral signs are the only ones diagnosed. This may be attributed to the

fact that the examiner fails to consider the characteristics of the murmur produced. Clinically, the murmur is described as a blowing diminuendo murmur starting with the second sound and best heard along the third left sternal border. Auscultation with the patient stooping forward in the seated position and during apnea after forced expiration is often helpful in detecting a faint aortic diastolic murmur. This is further enhanced by the use of the Bowles diaphragm chest piece, which reduces masking effects of the loud and lower-pitched

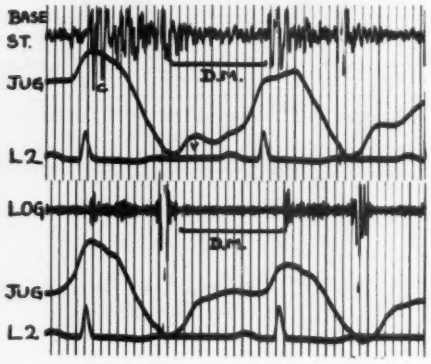

FIGURE 7. *Stethoscopic and Logarithmic Phonocardiograms over the Base, with Simultaneous Jugular Phlebogram and Electrocardiographic Lead 2, Showing a Decrescendo Diastolic Murmur of Aortic Regurgitation.*

In this case the diastolic murmur was not easily heard on clinical auscultation mainly because of the fatiguing effect on the ear produced by the loud systolic murmur and the markedly accentuated second sound.

second sound and facilitates perception of the low-intensity, high-pitched diastolic murmur. This phenomenon may be readily observed in logarithmic phonocardiograms registered with the open-bell and Bowles chest pieces.

Wells, Rappaport and Sprague[42] have studied phonocardiograms showing basal diastolic murmurs and noted that the murmur at times starts a short interval after the second sound with a short initial crescendo and a longer and gradual diminuendo. It varies in duration, although it often occupies the major portion of diastole and may last until the next first sound. In some cases the murmur was continuous in intensity and configuration throughout diastole. Several cases revealed inaudible diastolic vibrations in the phonocardiogram (Fig. 7). It is not unlikely, therefore, that the phonocardiogram will eventually furnish the earliest indication of aortic incompetence by registering inaudible murmurs.

The diastolic apical murmur occasionally encountered in aortic regurgitation, the so-called Austin-Flint murmur,[43] occurs much more rarely than is often thought.[44, 45] Currens and Hill[46] heard it in only 6 of 100 patients with syphilitic aortic incompetence. The absence of the typical presystolic crescendo phase has been emphasized to distinguish an Austin-Flint murmur from a mitral diastolic murmur. There are cases, however, in which an Austin-Flint murmur may also show a presystolic crescendo phase. The higher frequency — and hence pitch — of the Austin-Flint murmur is probably a more constant feature, in contrast to true mitral diastolic murmurs.[47]

In a small number of patients, aortic stenosis may develop in the course of rheumatic fever. Its recognition is often not too difficult because of the characteristic murmur present. The murmur is very intense, early in systole, best heard over the area and well conducted to the upper right sternal border and neck. Occasionally it has been found to be unusually well heard over the apex (Fig. 8). In such circumstances an accentuated and well defined first apical sound is a valuable guide for the differentiation of an intense mitral murmur from an unusual aortic apical systolic murmur. In the phonocardiogram, the murmur has been described with a typical diamond-shaped configuration because of its symmetrical crescendo-decrescendo phases.[21, 48] Although pulmonic stenosis may show a similar configuration,[49] pulmonic-valve involvement in rheumatic fever is so rare that it almost

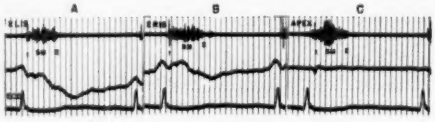

FIGURE 8. *Logarithmic Phonocardiograms over the Apex, Pulmonic Area and Aortic Area in a Case of Aortic Stenosis, Registered at the Same Phonocardiographic Sensitivity.*

These show the characteristically intense crescendo-decrescendo diamond-shaped systolic murmur in all areas. It was somewhat unusual to find the murmur better heard and registered over the apex than over the aortic area. Diagnosis was confirmed by fluoroscopic and roentgenographic evidence of a calcified aortic valve.

never offers a difficult diagnostic problem in the rheumatic patient.

TRICUSPID-VALVE DISEASE

In the patient with long-standing rheumatic heart disease and chronic congestive heart failure, the tricuspid valve may become involved either by actual rheumatic process or by an irreversible dilatation of the tricuspid ring. It has been said that tricuspid disease rarely presents distinctive clinical signs. This is particularly true of auscultatory manifestations, either because they are equivocal or because they can hardly be differentiated

from those of mitral-valve disease. The problem becomes more difficult when one considers the frequent association of mitral lesions in patients showing tricuspid involvement. The finding of mitral-like murmurs better heard over the tricuspid area, with or without accompanying apical murmurs, offers a strong indication of tricuspid-valve disease. Rivero Carvallo[50] observed that tricuspid murmurs vary in intensity with respiration, often becoming more conspicuous during inspiration, whereas mitral murmurs are either not influenced by or become less manifest during such a procedure. He attributes this to the increased blood flow into the right chambers during inspiration, which enhances the production of acoustic signs arising from this side of the heart. On the left, this is not so conspicuous because of the wide pulmonary capillary bed, which easily expands and thus prevents sudden and marked changes in left-sided filling. Aceves and Carral[51] found this observation positive and of distinct help in diagnosis in 80 per cent of their series of tricuspid-valve disease diagnosed in life and confirmed at post-mortem examination.

More objective evidence, especially of tricuspid insufficiency, pertains to the typical changes on the jugular phlebogram (Fig. 9). White[24] em-

FIGURE 9. *Jugular Phlebograms.*

The tracing in A *shows the typical contour in tricuspid insufficiency, in which the systolic rise is high and sustained and a deep early diastolic collapse is present. Record* B *demonstrates the contour of the carotid pulsation in this patient.*

phasized a prominent systolic jugular pulse as a diagnostic sign of tricuspid insufficiency. This is further characterized by the typical pattern of the jugular phlebogram,[52] which shows a positive systolic wave followed by an abrupt, deep diastolic collapse at the time of the opening of the auriculoventricular valves after the second sound. Recently, Messer et al.[53] pointed out that the rapidity and degree of systolic rise, as well as the diastolic collapse, may offer evidence in distinguishing insufficiency from stenosis of the tricuspid valve.

DISCUSSION

There still are a number of other signs described in the literature that may lend further corroborative evidence to the diagnosis of the specific type of rheumatic valvular disease. Among these are the pulmonic diastolic murmur of Graham Steell,[54] which is due to functional pulmonic regurgitation in mitral stenosis, and the Traube–Duroziez murmur[55, 56] or "Doppleton" heard over the femoral artery in aortic regurgitation. Phonocardiographic investigations[57, 58] on these phenomena have not been very extensive because of the inconstancy of these signs and because they are often merely additional findings to the more distinctive ones already discussed.

There are also auscultatory phenomena observed in rheumatic valvular disease that need further clinical and graphic study. The problem of delineating

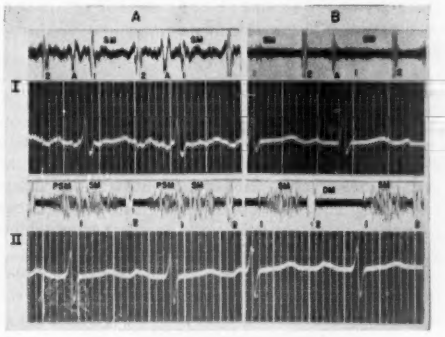

FIGURE 10. *Phonocardiograms in 2 Cases.*

In Record I (stethoscopic in A *and logarithmic in* B*), with electrocardiographic Lead 2 of an eight-and-a-half-year-old boy suspected of having rheumatic heart disease because of auscultatory signs of mitral stenosis, the phonocardiograms showed the following auscultatory illusions: the second sound was taken for the first, the loud auricular sound for the second, the first sound for the third, and the systolic murmur for a diastolic murmur. The logarithmic phonocardiograms in Record II (over the apex in* A *and midprecordium in* B*), with electrocardiographic Lead 2 of a seven-year-old girl suspected of having a patent ductus arteriosus, showed that the to-and-fro murmur was presystolic-systolic and hence not consistent with patent ductus arteriosus and instead suggestive of mitral-valve disease.*

normal variations of the third sound from the short diastolic rumble is a common source of difficulty that may lead to an erroneous diagnosis of mitral stenosis. In certain cases of mild rheumatic heart disease a short, early, low-pitched, dull diastolic murmur has been heard over the third left interspace close to the sternal border, the significance of which is unknown. Changes in the first apical sound need further investigation for the presence of certain inherent variations that may be of diagnostic value prior to the appearance of a murmur.

Of unusual value is the role of the phonocardiogram in reversing diagnostic impressions in rheumatic heart disease. The extreme situations are illustrated in Figure 10. In the first case, mitral stenosis was suspected because of auscultatory findings that were considered fairly characteristic. Actually, the phonocardiogram revealed that the second sound was interpreted as the first, the loud auricular sound as the second, the first sound as the third, and the systolic murmur as a diastolic rumble. It became obvious, therefore, that the case could not be diagnosed as mitral stenosis. In the second case mitral disease was initially suggested by the

phonocardiographic findings. The diagnosis of patent ductus arteriosus was originally considered because of a long and continuous murmur. However, it became evident from the phonocardiogram that the murmur was not systolic-diastolic with late systolic crescendo, as in patent ductus arteriosus, but was a presystolic-systolic murmur that suggested mitral insufficiency and stenosis. From these 2 cases it should be obvious that the phonocardiogram is invaluable as a supplement to auscultatory procedures.

Summary and Conclusions

In rheumatic valvular disease, satisfactory correlation between auscultatory signs and phonocardiographic findings may be achieved, if the graphic registration is carried out with adequate apparatus and correct technic. As a result, the nature of these acoustic signs is now better understood, and their clinical recognition facilitated.

Phonocardiography and other related graphic methods of study have generally confirmed the original clinical descriptions and interpretations of the auscultatory signs of rheumatic valvular disease. This is particularly true in mitral stenosis. In a number of cases, however, newer concepts have been introduced. Thus, it is now known that the duplication of the second sound in mitral stenosis is due to the opening snap of the mitral valve. Graphic studies have also shown that certain variations or combinations, or both, of normal phenomena may produce acoustic impressions closely simulating the true signs of mitral stenosis. This may be illustrated by the false diastolic rumbles and presystolic crescendo murmurs both in sinus rhythm and during auricular fibrillation. In contrast, mitral insufficiency seldom exhibits auscultatory and graphic findings of as great diagnostic valve as those in mitral stenosis.

Diagnosis of aortic-valve disease has also been greatly facilitated through the knowledge of the graphic characteristics of the murmurs produced. This is true in both stenosis and regurgitation, on the basis of the typical configurations of the murmurs in both and the characteristic high frequency of that in aortic regurgitation.

The murmurs in tricuspid-valve disease have not been intensively studied. However, the diagnostic pattern of the jugular phlebogram offers the most objective method of diagnosis.

Finally, phonocardiography may in rare cases completely upset auscultatory analysis owing to the inherent limitations of the latter procedure. The diagnosis of rheumatic valvular disease may be proved erroneous in some cases by phonocardiographic data that reveal auscultatory misinterpretation. In others, the phonocardiogram may furnish the first indication of valvular disease. The value of phonocardiographic procedures as a means of solving such cases of questionable diagnosis is illustrated and discussed.

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THE PROTECTION OF PERSONNEL ENGAGED IN ROENTGENOLOGY AND RADIOLOGY*

Final Report

F. T. Hunter, M.D.,† and L. L. Robbins, M.D.‡

BOSTON

In a preliminary report[1] a film badge was described that gave quantitative information on both the amount and the quality of radiation received by personnel in the Department of Radiology of the Massachusetts General Hospital. It was also planned to see if these measurements could be correlated with changes in the peripheral blood picture over a long period. The present communication, however, brings this study to a close, because all personnel are now subject to exposures far below the effective biologic level, and no statistical evidence could be obtained that radiation was affecting, or had affected, the peripheral blood picture.

Effects of Monitoring X-ray Personnel

Film-badge monitoring has produced several important results. In the first place, merely wearing the badge — coupled with the new knowledge that scattered radiation is "harder" than the original beam — has made most personnel much more careful. This increased caution is particularly apparent to those radiologists who have the duty of teaching inexperienced physicians, and of supervising the employees of a radiologic department. Upon receiving his film badge, the resident doctor realizes at the start of his training that the specialty he has chosen is one in which there is a definite danger. Otherwise, he may not become aware of this fact until several months have gone by.

The beginner, still learning to employ his eyes correctly, tends to use the fluoroscope for a longer time, and with the shutter opened wider than is necessary. He thereby exposes himself to much larger amounts of radiation than the experienced and rapid fluoroscopist. The warning badge, however, soon causes him to avoid needlessly exposing himself or his patients to the hazards entailed.

Nurses who are subject to daily radiation exposure have also become more aware that they are in a hazardous occupation. Since monitoring was instituted it has been observed that they are more careful not to walk through a room in which a patient is being examined, and are more apt to avoid being in the room when an exposure is made. It has also been evident that when the patient's condition requires that he be held, the attendant does this with far greater circumspection.

Technicians who take dental films — as many dentists do — often yield to the temptation to hold the film in place instead of having the patient do this for himself. This dangerous technic has been made impossible by providing a lead barrier between the technician and the tube and shortening the switchcord, so that the operator is unable to hold the film during the exposure. There still remain, however, technicians and nurses who continue long-standing careless habits. Despite these exceptions, monitoring has resulted in less exposure, and as a consequence, the period for collecting badges and

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processing film has been extended from two to three weeks. It seems likely that this can soon be lengthened to four weeks.

Definite technical improvements have also resulted from film-badge monitoring. For instance, the gap in the fluoroscopic table, mentioned in the previous report,[1] has already been corrected by some manufacturers. Several points brought to light by the study are of importance to architects and to those associated with architectural design. With the "permissible" exposure being continually reduced, the amount of lead required in the construction of rooms in which ionizing energy is to be used must be reconsidered. Its height and thickness, as well as its weight, must be completely re-estimated, and protection *amply* provided for in new construction.

Although setting up and positioning roentgenographic equipment may be left to the radiologist, the architect is in a position to point out that tubes should not be directed toward corridors, nor at corridor doors that are not properly sheathed with lead. Tubes should also not be directed at nearby buildings, nor at the control stand unless a proper barrier is in position. Above all, no hospital administrator or trustee should ever allow the cost of an essential protective measure to delay its installation.

Exposure to Radium

Monitoring of personnel handling radium needles over an extensive period brought to light a surprising, and what was for a long time a puzzling fact. This was that *films worn by radium workers usually showed "harder" radiation than the standards.* It was first thought that back scatter from the wearer's body was the cause of this, since the special sensitive film (duPont No. 552) used for this purpose contained no lead-foil backing. But employment of a specially prepared film* containing lead foil soon proved this assumption to be false. Other experiments to determine whether back scatter from heavy metals was causing the phenomenon failed to throw light on the problem. It became clear, finally, that *these films gave evidence of a "harder" radiation, because the persons wearing them actually received "harder" radiation.*

This was apparently due to several circumstances. The standards were prepared by exposing two film badges to a calibrated radium-platinum needle with *no additional filtration*, so as to obtain an exposure of 200 mr. The quality of radiation was indicated by the logarithm of the *ratio* of net film density under the open window and the cadmium filter ($\log D_o/D_c$).† Whenever this value on a worn film was lower than that of the standard, it indicated that the radium worker had been exposed to radiation whose *average* "hardness" was greater than that of the standard.

Just as with 90° scattering of 85 kvp x-rays,[1] gamma radiation can be increased in *average* "hardness" by filtration. This arises from the fact that radium element in equilibrium with its decay products gives rise to gamma radiation of varying intensities at twelve different energy levels.[2] In this respect it is similar to the continuous spectrum of a heterogeneous x-ray beam, whose longer components are more easily absorbed than those of shorter wave length. Hence, films showing a "hardness" greater than that of the standards can be regarded as evidence that the radium worker is actually using lead filtration for protection. The same observation is applicable to technicians working with supervoltage x-rays filtered through a lead or concrete barrier.

Average Weekly Exposure

The average weekly exposure of individual workers has been quite varied (see Fig. 2). Over a period of twenty months this has ranged from less than 1 up to 31 mr. Of the 4 persons with an average weekly exposure above 20 mr, 2 were radium workers, 1 was a dental technician, and the fourth was a resident physician who, early in his training, handled considerable amounts of radium over a short period. *If the "permissible" limit is really 300 mr weekly, the highest measured exposure was one tenth of this.*

The expression *measured exposure* requires a word of comment. In a few cases films have been turned in showing so much blackening that quantitation was impossible. It is now the rule that if anyone believes he has received too much exposure, he is given a new film for the remainder of the period. Both films are then developed, and the exposures totaled when possible. Extreme blackening has occurred so seldom, however, that the exposure data here given are believed to be reliable.

Peripheral Blood Picture

With the probability that deviations from the normal blood picture would be slight in extent, three arbitrary criteria were chosen as the limits of normal: a leukocyte count not less than 6000 nor more than 10,000 per cubic millimeter; a polynuclear percentage not less than 60; and an eosinophil percentage not above 3. Between September, 1948, and June, 1950, blood examinations were made every two weeks on all available personnel, resulting in satisfactory data on a total of 55 persons exposed to radiation.

Leukocyte Counts

In some workers, in whom the leukocyte counts were few in number and showed no wide deviations, these were averaged. On each of the remaining personnel, the counts were handled by determining the 50 percentile level by the use of arithmetic

*Furnished by E. I. duPont deNemours, Incorporated, Photo-products Department.

†This value has been a remarkably constant one, with a deviation of scarcely 5 per cent over a two-year period.

probability scales. On this type of ruled paper, if the sample is a representative one and the probability distribution curve is relatively symmetrical, the determined points will approximate a sloping straight line, and where this line crosses the 50 percentile line, the value on the ordinate will give the median leukocyte count for that person without further calculation.

When the individual medians had been thus obtained, they were treated again in precisely the same fashion. It so happened that these new points closely approximated another straight line in the 20 to 80 percentile range, and gave a median for the 55 individual medians of 7500 leukocytes per cubic millimeter — a normal value (Fig. 1). This was good evidence that the leukocyte counts were random samples, and that radiation had in all probability not affected them.

The individual median counts were then plotted on rectilinear paper in the usual way against the average weekly exposure in milliroentgens (mr). This showed no correlation whatsoever (Fig. 2). Finally, a plot was made of the individual median counts against the number of years the person had been engaged in roentgenology, and this also showed only random scatter of the points (Fig. 3). From these data, then, it must be concluded that this particular group gave no evidence of radiation affecting the leukocyte count.

Decreased Polynuclear Percentage

On each worker the number of times the polynuclear percentage was found to be below 60 was divided by the number of differential counts made. This gave the percentage of the time that this occurred. When these values were plotted against both the worker's average exposure per week and the number of years of exposure, the points again were scattered at random. Therefore, there seems to be no reason to assume that the slightly decreased polynuclear percentages seen from time to time in this group were due to radiation.

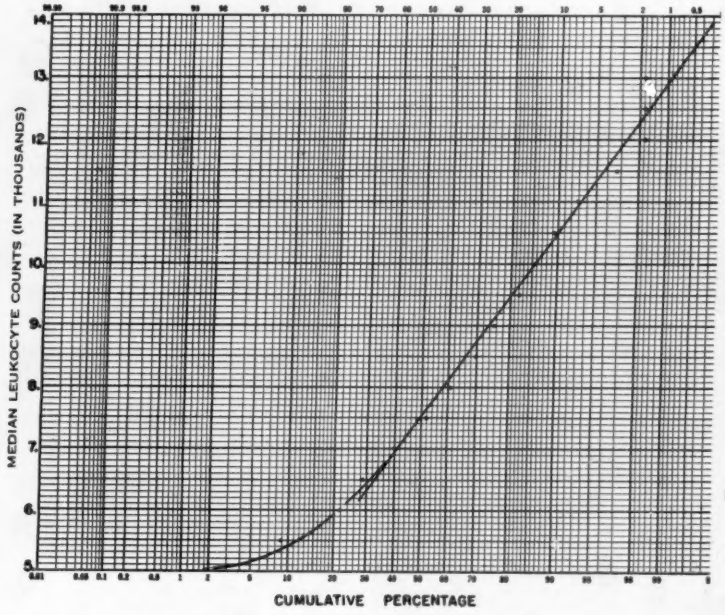

FIGURE 1. *Graph, Showing No Effect of Radiation on Leukocyte Counts.*

Increased Eosinophil Percentage

Cases of eosinophil percentages above 3 were handled exactly as the decreased polynuclear percentages just described. Again, no correlation could be found with the average weekly exposure, nor with the total years in roentgenology. This also proved true when all persons with allergy were eliminated.

It is believed that the criteria for a normal blood picture here employed were strict enough to have revealed trends from normality if they existed. It is also believed that the data were ample, and that the method of statistical evaluation used is valid. If this is true, the only conclusion one can draw is that the individual deviations from the normal blood picture, which have caused some anxiety in the past, are unrelated to x-ray exposure.

Future of Monitoring

Since few hospitals, and almost no radiologists in private practice, have the facilities for carrying out a monitoring program, responsibility for this field of preventive medicine becomes increasingly important. It must not be forgotten that employees in a number of industries and trades are likewise subject to radiation exposure, and new occupational hazards — as in the retail shoe trade[3, 4] — are continually coming to light. Although monitoring service can be obtained from a few commercial laboratories, an activity of this nature should properly belong to a public-health agency — presumably to the industrial-hygiene division of a state health department.

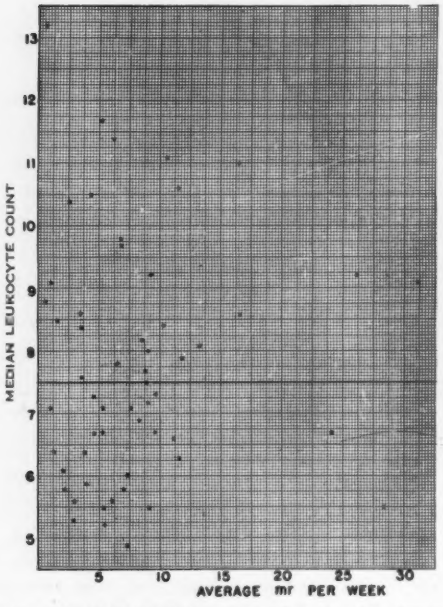

Figure 2. *Individual Median Counts Plotted against Average Weekly Exposure (mr).*

Public-health departments are, or should be, primarily responsible for preventive measures that the worker cannot perform for himself. In this category fall numberless routine activities such as milk inspection, vaccine production and fume concentration measurements in factories. It seems reasonable to place radiation monitoring in the same category. Monitoring programs are being planned for by Government health agencies elsewhere.* Perhaps health departments in this country should seriously consider this question.

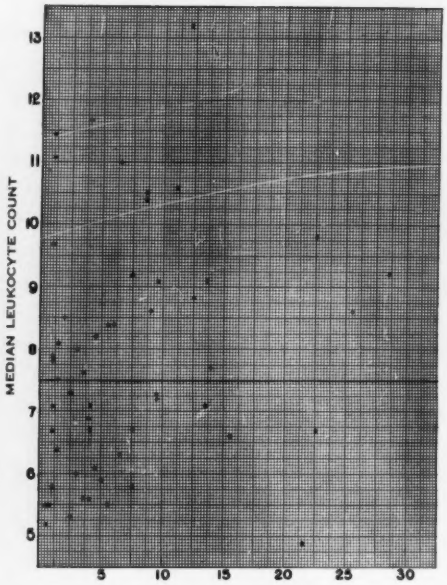

Figure 3. *Individual Median Counts Plotted against Years of Work with X-rays.*

Summary

Film-badge monitoring has led to lowered radiation exposure, and is therefore well worth the effort. Personnel become more cautious, and flaws in technic and protection are discovered.

Radium workers may be subject to radiation "harder" than that of standards prepared from radium-platinum needles with no extra filtration.

The personnel covered in this study are now receiving an average weekly exposure less than one tenth the so-called "permissible" exposure.

*Authoritative information is at hand that the Division of Industrial Hygiene of the Ministry of Health, Province of Quebec, is planning such a monitoring service.

Variations in the leukocyte count and in the polynuclear and eosinophil percentages showed no statistical evidence of being related to the average weekly exposure, nor to the number of years the worker had engaged in roentgenology.

Radiation monitoring appears to be a proper function of public-health agencies.

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URINARY DIASTASE IN MUMPS

Martin M. Nothman, M.D.*

BOSTON

ELEVATION of serum diastase has been found in the great majority of adult patients with mumps.[1-6] The increased levels may assist in establishing the diagnosis in doubtful cases. Most of the studies were performed on soldiers in epidemics of parotitis during the war. Examinations of the serum diastase in children have been rare. Applebaum[1] included 3 cases in his series of 60, and Murphy, Bozalis and Bieri[6] 4 in a series of 35.

Since an elevated level of diastase in the serum brings about an increase in the urinary excretion of the enzyme it was to be expected that the urinary diastase in mumps would be elevated. If this is so the urinary diastase test may become valuable for the diagnosis of epidemic parotitis in children. Series of examinations could be performed in cases in which it is difficult to draw the blood for a single serum test. Cellulitis of the face, infection of the teeth and gums, preauricular and cervical adenopathy and other conditions that may at times create difficulties in the differential diagnosis can be eliminated. The investigations reported below prove the usefulness of the urinary diastase test for this purpose.

Occasionally, the swelling of the submaxillary glands precedes that of the parotid. In rare cases they even remain the only glands affected. It was suggested that in these cases the urinary diastase test might also be helpful for the diagnosis.

There is general agreement that the source of the elevated serum diastase in mumps is the parotid gland. Through the investigations reported below an attempt was made to find evidence that the increased urinary diastase is of parotid origin.

Dunlop,[7] in a short report, states that in acute parotitis there is an increase in the diastase output by the kidney. Fennel,[8] using a method of his own, found increased diastase in the urine of an unspecified number of cases of mumps.

I examined the urinary diastase in 30 patients with mumps, in some of them five and ten times during the disease; 27 were children, and 3 were adults. In addition the test was performed in 10 patients with swelling on the face due to other conditions than mumps. For the determination of the urinary diastase the Somogyi method was used, the normal range of urinary diastase varying between 80 and 350 units. The result of the test is presented in Figure 1.

A marked elevation of the urinary diastase was evident in every case. Frequently, the increase observed went well over 1000 units, the highest figure being 7700 units. The rise of the urinary diastase begins on the first or second day after the swelling of the parotid gland is seen and may last for five to six days or even longer.

Table 1. *Urinary Diastase in Cases of Mumps with Unilateral Swelling Followed by Swelling on the Opposite Side.*

Case No.	Urinary Diastase*													
	1st day units	2nd day units	3rd day units	4th day units	5th day units	6th day units	7th day units	8th day units	9th day units	10th day units	11th day units	12th day units	13th day units	14th day units
25	1585	—	1405	—	945	740	†	1250	—	405	—	—	225	—
26	—	355	—	820	—	—	240	†	995	—	1410	—	860	420
27	420	—	1220	1450	920	420	†	1240	920	760	—	520	—	180
28	—	665	—	960	—	260	†	1280	—	320	—	—	—	—
29	—	—	1420	—	450	—	220	—	†	840	960	640	—	250
30	—	—	1100	—	320	†	1280	1300	—	—	360	—	240	—

*After first appearance of unilateral swelling.
†First appearance of swelling on the opposite side.

*Instructor in medicine, Tufts College Medical School; associate physician in internal medicine, Joseph H. Pratt Diagnostic Hospital; district physician, Medical Department, Boston Dispensary.

Three cases are of special interest. Generally, the peak is reached on the third, fourth or fifth day. In these 3 patients the swelling was limited to the submaxillary glands when the disease started. At that time they already showed a markedly increased value for urinary diastase. Swelling of the parotid glands, with further rise of the urinary diastase, later developed in 2 cases. In the third case the swelling remained limited to the submaxillary glands. Nevertheless, this patient showed an elevation of the urinary diastase to 2100 units. All 3 cases in all probability would have been overlooked or would have come under observation much later if siblings had not already developed mumps with swelling of the parotid glands some days before.

In 6 cases (Table 1) the swelling of the glands began unilaterally, and after six to nine days the opposite side became affected. In these patients the urinary diastase, which had already started to drop or had even reached normal values with a parotid gland of normal or almost normal size, started to rise again with the progressing enlargement of the second gland.

In 10 cases with cervical adenitis, cellulitis of the jaw or swellings on the face from other causes the urinary diastase was normal.

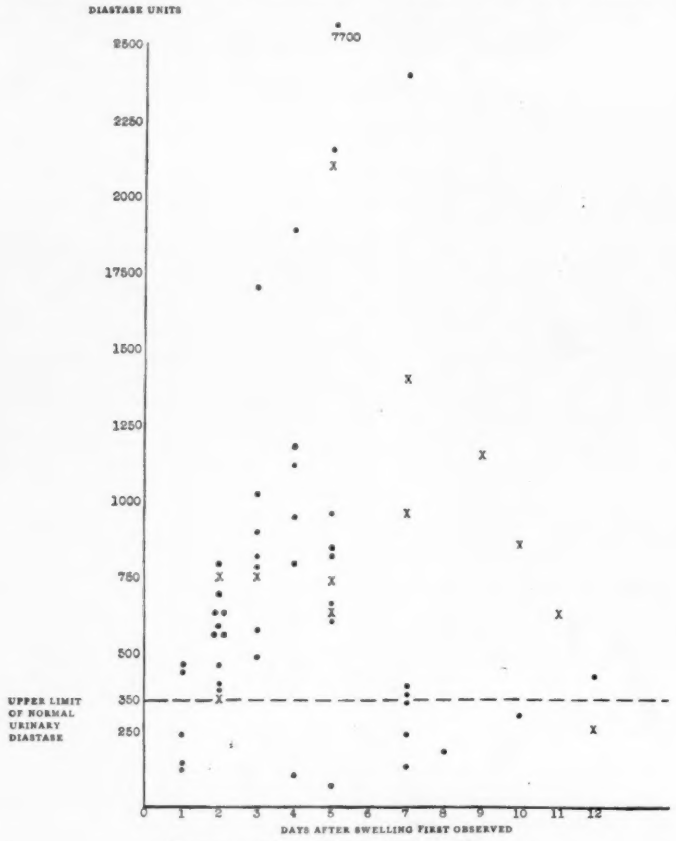

FIGURE 1. *Urinary Diastase Levels in Mumps.*
• = *parotid and* X = *submaxillary swelling.*

DISCUSSION

All patients with epidemic parotitis examined showed a marked increase of the urinary diastase. The elevation of urinary diastase, therefore, can be used as a diagnostic help in mumps. When the swelling in the face was from causes other than epidemic parotitis there was no rise of the diastase in the urine. Since the diastase values are also elevated in cases in which the disease starts with an involvement of or remains limited to the submaxil-

lary glands the diagnostic value of the test becomes increased.

It is generally accepted that the source of the increased serum diastase in mumps is the parotid gland. The enzyme probably diffuses into the blood stream after the cell membranes of the acinic tissue have been damaged.

The reason for this assumption is the fact that ligation of the parotid glands in dogs[9] and calculous obstruction of the salivary glands in human beings[10] also result in an increase of serum diastase. The pancreatic gland is another possibility. In adults pancreatitis complicating epidemic parotitis is not rare.[11] In these cases the elevated values for serum and urinary diastase could be derived from the pancreas. But in many cases of mumps in adults and in almost all cases of mumps in children there are no abdominal symptoms, and there is not the slightest reason to assume any involvement of the pancreas. The fact that epidemic parotitis in children leads to an elevated urinary diastase, which subsides with the disappearance of the swelling of the parotid and recurs when the opposite parotid gland becomes involved, adds evidence that the source of the elevated urinary diastase is the parotid gland.

Summary

The urinary diastase output was studied in 30 cases of mumps, most of them in children. All cases showed a markedly increased value for this enzyme.

The elevated urinary diastase is of value in differential diagnosis in all cases with swelling about the jaw of obscure nature since patients with swelling not due to mumps do not show the increase of diastase.

Cases of mumps that start with a swelling of the submaxillary glands show an elevated urinary diastase even if the swelling remains limited to these glands.

When the involvement of the parotid gland is unilateral the value of urinary diastase falls with the decrease of the size of the gland and rises again when the opposite side becomes enlarged. This fact supports the conclusion that the parotid gland is the source of the increased diastase in the urine.

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RHINOLITH AS A CAUSE OF SUPPURATIVE RHINITIS*

Report of a Case

N. Edward Nachlas, M.D.†

BOSTON

THE subject of rhinoliths has been completely reviewed several times.[1-4] With the increase in routine nasal examination, better nasal hygiene and more adequate medical facilities, this entity is becoming increasingly rare.[5, 6] In the past fifteen years only 3 patients with the disease have been admitted to the Massachusetts Eye and Ear Infirmary. The case reported below was the only one of these cases complicated by rhinitis caseosa.

Rhinoliths may be either endogenous (formed completely within the nose by the deposit of inorganic salts around a nucleus of mucus, tissue or bone) or exogenous (formed around a foreign body). They have been also classified as true and false rhinoliths.[1, 7] The more common symptoms are unilateral nasal obstruction and discharge. Although radiography may aid in diagnosis, many rhinoliths are radiolucent. The x-ray film may show bony destruction similar to that found in carcinoma. If the stone is removed in its entirety, there is little tendency to recur, and cure is permanent.

A rare complication of rhinolith is rhinitis caseosa.[1, 8] This is a clinical diagnosis based on chronic nasal discharge, putrid odor, friable caseous material in the nose, bone destruction and anosmia. It has been called by some "nasal cholesteatoma," a term falling into disrepute. The etiology has been described by different authors as[1] stagnating nasal discharge due to nasal obstruction,[2] tuberculosis,[3] *Streptothrix alba*,[5] fungus[4] and cholesteatoma.[8] The first is the most probable cause, but none of these etiologies have ever been satisfactorily demonstrated. In the differential diagnosis, granuloma, neoplasm and foreign-body reaction should be considered. Another rare complication of rhinolith is multiple sinus infection. Polson,[1] in a review, reports only 5 such cases.

The following case is reported because of the increasing rarity of the condition and because of

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the several unusual features it exhibits. It many respects this case resembles the one reported by Hutcheon[9] in 1941.

Case Report

B. M., a 40-year-old mentally deficient woman, was first seen on March 6, 1950. The chief complaints were nasal obstruction and foul nasal discharge of 1 year's duration, bloody nasal discharge of 3 months' duration, left-sided swelling of the face of 1 week's duration and severe face pain. There was no previous nose or sinus complaint.

Physical examination showed both nares full of foul, friable, caseous material. There was a firm swelling of the left side of the face over the maxillary region. Cultures were obtained, and x-ray examination demonstrated a calcified mass in the nasal chamber, in the region of the septum, halfway back from the vestibule, with a questionable rhinolith (Fig. 1). Both ethmoids and antrums were full. The left side of the nose was expanded, with a break through the

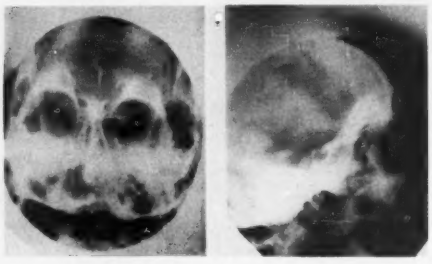

Figure 1. *Roentgenogram, Showing Questionable Rhinolith (Courtesy of Dr. A. S. MacMillan).*

front wall of the left antrum. The chest was clear. The patient was admitted to the Massachusetts Eye and Ear Infirmary, and a biopsy was taken under local anesthesia on March 7. The pathological report was chronic inflammation.

On 3 successive days large portions of foul, caseous material were removed. On the 3rd day a stony-hard mass was removed from the left naris. It was black and irregular and measured 2 by 1.5 cm. On March 10, under general anesthesia, a Caldwell–Luc operation was done on the left maxillary antrum, for the chronic maxillary sinusitis.

There was destruction of the bone around the pyriform aperture, and the lateral wall of the nose was completely destroyed. The septum was perforated, and the caseous, foul mass also filled the right naris. Biopsies of the indurated contents of the antrum were reported as showing chronic inflammation with metastatic bone formation. With daily cleansing by a spray of iodine, menthol, camphor and liquid petrolatum the fetid odor diminished.

Nose cultures taken on March 6 showed a coagulase-negative hemolytic *Staphylococcus aureus*, a pneumococcus (not Type III) and a beta-hemolytic streptococcus. Postoperative x-ray study on March 14 disclosed infection in all sinuses. The patient received Crysticillin. At no time during hospitalization did the temperature go above 100.6°F. by rectum. Examination of the blood showed a red-cell count of 3,660,000, with a hemoglobin of 10.7 gm. per 100 cc., and a white-cell count of 10,000, with 78 per cent neutrophils, 21 per cent lymphocytes and 1 per cent basophils. Examination of the urine and a blood Hinton test were negative.

The patient was discharged on March 16. The nose remained clean, and the swelling regressed.

Discussion

Though it has been known as a clinical entity since the early periods of laryngology, there is little exact knowledge about the microscopical picture of rhinitis caseosa. The presence of cholesterol crystals was reported by some observers, but others did not see them. Microscopical examination in the case presented above showed chronic inflammation of the fibrotic type, with some areas suggestive of granulation tissue. In the midst of the fibrous

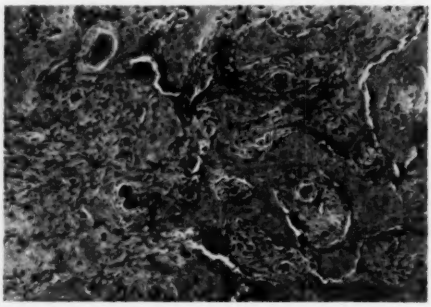

Figure 2. *Microscopical Section, Showing New-Bone Formation.*

tissue were areas of new-bone formation (Fig. 2). In this case no normal mucous membrane was present, but the specimen was diagnosed grossly as mucous membrane of the antrum. Kelemen[10] cites Rendu as listing the mucous membrane of the sinuses among the tissues with osteogenic properties. Perhaps the areas of bone formation would later have formed the nucleus of new rhinoliths had the condition been allowed to progress. No cholesterol crystals could be demonstrated.

The diagnosis of rhinolith and rhinitis caseosa should be considered in cases of nasal obstruction, unilateral or bilateral, nasal masses and nasal discharge, with or without x-ray evidence of bone destruction.

Summary

The literature on rhinoliths is briefly reviewed, and what appears to be the first recorded case in the United States complicated by rhinitis caseosa and pansinusitis is reported.

243 Charles Street

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FIFTY YEARS OF MEDICAL PROGRESS

THE SCIENCE AND THE ART

REGINALD FITZ, M.D.*

BOSTON

FIFTY years ago the first number of the *Boston Medical and Surgical Journal* for the new year contained an interesting editorial.

In commenting on the truly impressive changes in medicine during the period from 1801 to 1900, the editorial mentioned that one of the greatest was due to the establishment of bacteriology as a science. For, now, it was possible not only to find the cause of diseases that were of bacterial origin but also, by virtue of this knowledge, to prevent their ravages. Certainly, the concept of preventive medicine was a forward stride.

Next in importance in the mind of the writer was the invention of various instruments that made possible the accurate examination of hitherto inaccessible parts of the body: examination of the eye, for example, by the ophthalmoscope, of the heart by the stethoscope or of broken bones by the x-ray. Indeed, he went on to say, hardly a discovery in the whole range of physics and science but had added something to the practice of medicine. The editorial ended with these words:

> One has but to mention ether, antisepsis, x-rays, the compound microscope, the clinical thermometer, the stethoscope, the ophthalmoscope and the other instruments for showing morbid conditions previously beyond the reach of vision, the use of active principles instead of crude drugs, the subcutaneous syringe, the use of manipulation instead of brute force in the reduction of certain dislocations, to show how great has been the advance, not merely in the investigation, but in the treatment of morbid conditions, and this list is so far from complete that everyone who reads will be able to suggest some important additions. To the physicians of a hundred years ago the physician of today would seem like a magician.

During the past fifty years medicine has continued to consolidate and even to extend the advances made in the previous half century; in certain directions advances have progressed almost too far and too rapidly for comfort. On the whole, however, medicine has learned a great deal in the past fifty years; by and large, it will probably be better practiced in 1951 than in 1901, though the common problems that today's physicians must face will be quite different from those that perplexed their predecessors.

One of the pleasant ways to reflect on what has gone forward in any field is by studying the printed record of the past. In April, 1915, the first volume of "Case Records of the Massachusetts General Hospital" was published[1] — a volume edited by Richard C. Cabot and his brother Hugh. Here is reported a series of 150 miscellaneous cases from the Massachusetts General Hospital in which clinical diagnoses and pathological findings were compared. The cases were discussed by the Cabot brothers before classes of undergraduate and postgraduate students at their famous clinicopathological conferences.

Their first volume is a fine source of information for one interested in trying to recall what diagnosis and treatment were like in the early days of this century, since the discussions of the two Cabots are quoted in their own words, and they spoke with characteristic positiveness. Their opinions fairly represent the opinions of two eminent clinicians of their day on a widely diversified clinical material.

One of the most striking features of this series is the frequency with which cases of syphilis, tuberculosis and other acute infections were discussed. Largely owing to preventive medicine, syphilis and especially syphilitic aortitis and aneurysm, seen not infrequently fifty years ago, have now become rare. This is a remarkable triumph when one stops to consider that in 1915 the diagnostic importance of the Wassermann test was only beginning to be generally accepted and Salvarsan was a new drug. One might develop a plausible argument that venereal-disease prophylaxis, which became established on a secure footing during the first World War, was one of the most significant medical contributions of that particular experience. In any event, the late manifestations of syphilis are seen much less frequently than they were half a century ago, and the early manifestations of syphilis are much better cared for. This is an important forward step.

Tuberculosis was another infection that cropped up in the Cabot cases frequently and often unexpectedly: pulmonary tuberculosis, miliary tuberculosis, renal tuberculosis and tuberculous meningitis. A definite campaign to check the incidence of tuberculosis by its early recognition and treatment is another step forward that has been taken in the past fifty years. The manner in which this came about is interesting; such a campaign would have failed without popular support. In this locality, voluntary associations like the Boston Tuberculosis Association deserve credit for the fearless manner in which they aroused public opinion, stimulated

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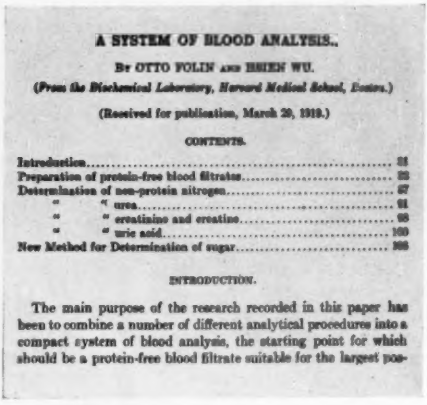
state and city interest and encouraged patients to obtain treatment as they needed it. Add to this, the development of surgical treatment for pulmonary tuberculosis and the hope that an antibiotic may soon be found that will cure tuberculosis, and one feels there is in sight the end of a long struggle, which so far has changed the disease from one of great importance to public health into one that is growing less threatening year by year. That this came about during the past fifty years is certainly noteworthy.

Other acute infectious diseases were common enough for the Cabots to meet repeatedly — particularly infections like the pneumonias, streptococcal infections such as erysipelas with resultant septicemia and, of course, typhoid fever.



A SYSTEM OF BLOOD ANALYSIS.

By OTTO FOLIN and HSIEN WU.

(From the Biochemical Laboratory, Harvard Medical School, Boston.)

(Received for publication, March 20, 1919.)

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INTRODUCTION.

The main purpose of the research recorded in this paper has been to combine a number of different analytical procedures into a compact system of blood analysis, the starting point for which should be a protein-free blood filtrate suitable for the largest pos-

FIGURE 1. *Title Page of Dr. Otto Folin's First Account of His System of Blood Analysis.*
This was a paper of profound importance, for it unlocked the door to the discovery of insulin and an entire new field of new knowledge (1919).

A whole volume could be written describing the clinical, bacteriologic, immunologic and preventive steps that have been taken in fifty years to bring about today's results. Lobar pneumonia, for example, in the lives of the Cabots, had a high mortality and except for good nursing care was practically untreatable. The introduction of pneumococcus typing and the use of serum therapy represented a distinct step in advance, followed by a much longer step when the sulfonamides and finally when the antibiotics were discovered. Only recently one of my colleagues at Harvard Medical School told me that it is now difficult to find cases of lobar pneumonia to demonstrate to students; what is termed atypical or virus pneumonia has come to occupy the center of the stage, and there is hope of soon conquering this. Certainly, lobar pneumonia has been turned into a much less significant disease than it was half a century ago.

In general, the same observations can be made regarding diseases of streptococcal origin, and surely diphtheria is much less important than it was. And, finally, typhoid fever has become a preventable infection so that in New England it is now a rarity. This will always appeal to me as being a miraculous accomplishment; I can remember as house officer when the medical wards of the Massachusetts General Hospital were filled during the summer and fall with patients who had typhoid fever and when it seemed impossible to imagine that the time could come when antityphoid inoculation would be routine and when the sources of typhoid infection in water supplies, food and privies could be jugulated. Yet this has happened; the prevention of typhoid fever and of smallpox stand out in my mind as two dramatic and triumphant accomplishments of preventive medicine.

The Cabots, of course, saw many diseases that have changed but little in character but have changed greatly in their vulnerability to treatment. As one reads the Cabot records one is struck with the astuteness of the two brothers at their clinics and with the poverty of their therapeutic and diagnostic armamentarium. There was morphine to use, digitalis, diuretics like diuretin, nitroglycerin, sodium bicarbonate, calomel and other cathartics or purgatives, potassium iodide, urotropin, which had established an eminent reputation as an effective urinary antiseptic, and, of course, a variety of other drugs in which various visiting physicians of the Massachusetts General Hospital might or might not have confidence. On the other hand, the Cabots had not at their disposal modern laboratory procedures — electrocardiographs, basal metabolimeters, blood chemical technics, or good x-ray films*; they did not understand fluid balance or the importance of electrolytes, and they had none of the modern drugs or active endocrine products that have proved their value, nor could they think in terms of pathologic physiology as the clinician of 1951 is trained to do.

What could Dr. Richard Cabot say of pernicious anemia in a man sixty-nine years old? Little more than that the differential diagnosis rested between cancer of the stomach and pernicious anemia and that the former diagnosis was excluded by negative stool examinations for occult blood, whereas the

*In his Shattuck Lecture before the Massachusetts Medical Society last June, Dr. Merrill C. Sosman[8] reported on the present diagnostic accuracy of the skilled radiologic eye in demonstrating and identifying significant lesions, as follows:

System	Demonstrate	Identify
	%	%
Lungs	95	75–80
Gastrointestinal tract	80–95	90
Bones	90	95
Genitourinary tract	90	90
Brain { Plain films	47	50
Brain { Special technics	98	30
Gall bladder	80	99

latter was supported by the blood examination, which showed red-cell counts falling from 1,920,000 to 988,000.

This particular patient failed steadily during a fifty-day period of hospitalization in spite of such therapeutic efforts as were made, and the diagnosis was confirmed.

Nowadays, Dr. George R. Minot's contribution has led to an entirely different concept of this disease and has made that hitherto insidiously fatal disorder of little significance.

What could Dr. Cabot say of Addison's disease in a twenty-one year-old man? The combination of hypotension, pigmentation, asthenia and gastrointestinal crises in this case led him to remark, "The diagnosis in this case is so obvious that the only point to discuss is whether any other diagnosis than the most probable one can be considered. Is there any doubt as to the diagnosis? What is the diagnosis?"

The class shouted loudly and cheerfully, I assume, "Addison's disease."

Dr. Cabot went on to add:

> The commonest cause of Addison's Disease is tuberculosis of the adrenals, and I see no reason in this case to go farther afield for the cause. The patient is young for malignant disease, and there is no evidence of tumor. I believe there will be found caseation of the adrenal glands. It will not be surprising if no active disease is found elsewhere. There will probably be found obsolete tuberculosis in the lungs — I should guess the process to be in the right apex. I should like to mention here the danger of giving tuberculin subcutaneously in Addison's Disease. We have occasionally done that at this hospital and I am sure have in some cases brought death. It takes very little to upset the balance between life and death in this disease.

These words stimulated Dr. Hugh Cabot to ask, "Has any success ever attended feeding with gland substance?"

"I am not satisfied that it has," answered Dr. Richard. "The only cases in which we have had success have been ones in which the diagnosis was not proved."

The patient had tuberculosis of the adrenal glands and foci of obsolete pulmonary tuberculosis. Thus Dr. Richard's diagnosis was well confirmed.

Remarkable progress has been made in the management of Addison's disease during the past fifty years: better diagnostic procedures, a knowledge of how best to manage what Dr. Cabot realized was the delicate balance between life and death that exists in adrenal insufficiency but was then of undetermined cause, and the development of an effective substitution treatment, which Dr. Hugh Cabot hoped might some day be found. Certainly these discoveries represent progress.

What could Dr. Richard Cabot say of diabetes in a man fifty-seven years old who entered the hospital with an inflamed corn and a swollen foot, who by way of treatment received a diet unlimited in respect to everything except its carbohydrate content, which was restricted to only 100 to 150 gm.? The patient became drowsy almost at once, and despite intravenous injections of sodium bicarbonate, he lapsed into fatal coma.

"Obviously," said Dr. Cabot, "this is a case of diabetes with beginning gangrene of the foot. According to present views the patient should have been starved from the outset. Coma might thereby have been prevented."

Think of the progress that has been made in the management of diabetes during the past fifty years: Dr. Joslin's systematic study of his patients, the Allen treatment, the discovery of insulin and of newer insulins, the desire of the American Diabetic Association to have diabetes recognized early when it is especially amenable to treatment, and the skill through combination of medical and surgical methods that now makes it possible for patients with diabetes to survive surgical operations almost as well as anyone else.

What was there to say of neurologic localization in the case of a twenty-four year-old man who complained of headaches growing progressively worse, of blurred vision, of a buzzing in both ears, more marked on the left than on the right, of dizziness on getting up and of transitory spasms in both legs — all finally complicated by vomiting? On physical examination he showed markedly choked disks in both eye-grounds, no loss of sense of position and otherwise no noted reflex changes.

It was Dr. Hugh Cabot's turn to discuss the case:

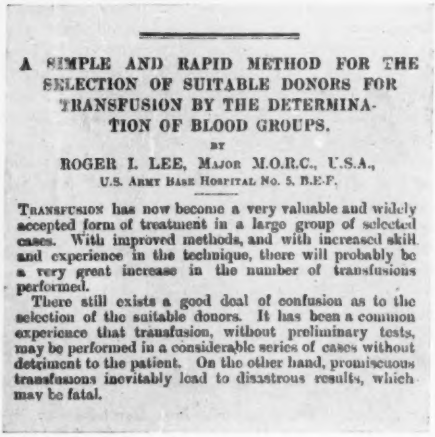
> I regard this as some form of neoplasm but am unable to localize the process. The involvement seems to be widespread and must be at some point wherein lies a variety of nerve fibres. I am not sure whether it could be a tumor of the cerebellum or whether it is more likely to be of the basic ganglia. On the question of operation, without more ability to localize it than I have, I should suppose that all they could do was to decompress over a large area with the possibility of halting the growth. I cannot see much evidence to localize it on either side. At best our results in operations upon brain tumors are not such as to make you wildly enthusiastic.

The patient had three exploratory subtemporal decompressions without discovery of the tumor; it was later found to be located in the cerebellar pontine angle.

Progress has been made in neurologic diagnosis, and treatment, too, in the past fifty years. Dr. Cabot's discussion of the case well represented the degree to which localization of brain tumors had advanced in his time. Even the neurologic consultant who was asked to see the patient could make no more accurate diagnosis than that of intracranial new growth without localizing symptoms. New methods have been developed, — the art of more precise neurologic examination, the use of x-rays, the introduction of air and even of radioactive isotopes into the cerebrospinal spaces, — and all have combined to make accurate diagnosis more possible. As a result, surgery in the treatment of brain tumors has advanced by leaps, and the end results

are not half as gloomy as they were fifty years ago. This is certainly a record of progress.

What could Dr. Hugh Cabot say about the new process of transfusion, which in certain cases seemed to offer so much and about which so little was known? A man fifty-five years old who was a "bleeder" entered the hospital with an uncontrolled hemorrhage from around the second molar tooth. For this he received a transfusion. During the procedure he was suddenly seized with severe pain



A SIMPLE AND RAPID METHOD FOR THE SELECTION OF SUITABLE DONORS FOR TRANSFUSION BY THE DETERMINATION OF BLOOD GROUPS.

BY

ROGER I. LEE, MAJOR M.O.R.C., U.S.A.,
U.S. ARMY BASE HOSPITAL No. 5, B.E.F.

TRANSFUSION has now become a very valuable and widely accepted form of treatment in a large group of selected cases. With improved methods, and with increased skill and experience in the technique, there will probably be a very great increase in the number of transfusions performed.

There still exists a good deal of confusion as to the selection of the suitable donors. It has been a common experience that transfusion, without preliminary tests, may be performed in a considerable series of cases without detriment to the patient. On the other hand, promiscuous transfusions inevitably lead to disastrous results, which may be fatal.

FIGURE 2. *Title Page of Dr. Roger I. Lee's Paper on Blood Typing, which Appeared in the* British Medical Journal. *This introduced safe transfusion methods to the British Expeditionary Force in France (1917).*

in the back soon followed by a chill. Subsequently, jaundice and, finally, anuria developed.

Dr. Cabot, in discussing this case, said:

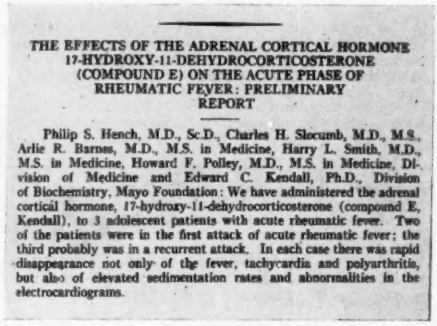
> The operation of transfusion was logical. Indirect transfusion is an excellent method of controlling hemorrhage. By this method you are doing something pretty positive in the way of controlling bleeding and, though I have no figures, I know of a considerable number of cases where hemorrhage has been promptly controlled.
>
> After the operation — in this case — it sounds as if Irish dividends were coming thick and fast. There is jaundice which comes with hemolysis. It is mere guess work on my part as to what the kidney will show. It may be an acute degenerative process, or might be classified as acute nephritis with the other evidences of anuria — a pretty thoroughly water-logged pair of kidneys.

Anatomically, hemorrhagic areas in the pleura, peritoneal tissues and pericardium were found, central degeneration of the liver and an acute nephritis, described as the scarlet-fever type, which had been going on for some time; the drain and shock of the terminal events hit a lame kidney, in the view of the pathologist.

His brother asked if the anatomic lesions seemed to account for death. The answer was "No." He closed the discussion by remarking that here was another case of death that must have been due to some undiscovered chemical process.

One should think of the progress that has been made in the use of transfusion since then — the perfection of accurate blood typing to prevent reactions such as this, the increasing use of transfusions in the first World War, Dr. Edwin J. Cohn's work in the second World War, in which plasma saved so many lives, and the manifold purposes for which transfusions of whole blood and plasma are now being employed. This is a striking chapter in the history of medical progress.

I have selected from the Cabot Records, to illustrate progress, only a few random case reports that happen to appeal particularly to me; progress along many other lines could easily be traced. The treatment of heart disease is more satisfactory than it



THE EFFECTS OF THE ADRENAL CORTICAL HORMONE 17-HYDROXY-11-DEHYDROCORTICOSTERONE (COMPOUND E) ON THE ACUTE PHASE OF RHEUMATIC FEVER: PRELIMINARY REPORT

Philip S. Hench, M.D., Sc.D., Charles H. Slocumb, M.D., M.S., Arlie R. Barnes, M.D., M.S. in Medicine, Harry L. Smith, M.D., M.S. in Medicine, Howard F. Polley, M.D., M.S. in Medicine, Division of Medicine and Edward C. Kendall, Ph.D., Division of Biochemistry, Mayo Foundation: We have administered the adrenal cortical hormone, 17-hydroxy-11-dehydrocorticosterone (compound E, Kendall), to 3 adolescent patients with acute rheumatic fever. Two of the patients were in the first attack of acute rheumatic fever; the third probably was in a recurrent attack. In each case there was rapid disappearance not only of the fever, tachycardia and polyarthritis, but also of elevated sedimentation rates and abnormalities in the electrocardiograms.

FIGURE 3. *Title Page of an Early Article by Dr. Philip Hench Describing Certain Aspects of ACTH.*
On the basis of this work, he and Dr. Edward C. Kendall received the Nobel award in medicine (1950).

was, in part because of greater diagnostic skill, in part because of new drugs, particularly the mercurial diuretics, in part because of the surgical relief of such lesions as patent ductus arteriosus or coarctation of the aorta or constrictive pericarditis and in large part, too, because of a clearer understanding of cardiac physiology. The treatment of kidney disease — chronic glomerular nephritis or chronic vascular nephritis, which Dr. Cabot recognized repeatedly in that first series of cases is now much better understood; the influence of diet and the management of edema are better defined, and the artificial kidney has come to play a part in saving life. The field of endocrinology has been cleared to an amazing degree. The treatment of pulmonary disease has been explored so that now removal of

an entire lung can be performed safely and pulmonary tuberculosis, bronchiectasis and intrathoracic tumors are amenable to surgery. Vitamin deficiencies can be recognized and corrected. Maternal mortality is lower than it has ever been before. The discoverers of ACTH have received a Nobel award. Radioactive isotopes are available for clinical use. As the editorial of fifty years ago stated, this list is so far from complete that everyone who reads will be able to suggest some important addition. Indeed, the past half century has seen great medical progress, and one can safely say that to the physician of fifty years ago the physician of today continues to seem even more of a magician than ever.

Such progress has been obtained neither easily nor cheaply. Mainly, it has been brought about by the creation of opportunities for research to gifted and well trained young men and by the results of their labors.

Dr. J. H. Means,[3] in a delightful essay, has recently traced the medical history of the past fifty years through a somewhat different pathway than the one I have followed. After the development of bacteriology, he emphasizes the importance of the development of biochemistry in the production of new medical knowledge, and finally suggests that although at the moment we are in what he terms the golden age of biochemistry, we may be on the threshold of an equally exciting age of physics. Surely, it seems now as if biochemistry and biophysics were likely to continue to bring to light new and fundamental medical knowledge for many years to come, and, surely, opportunities for such developments must be at hand.

Progress in any endeavor can never be straight and steady but must always follow a zig-zag course. In medicine, by erasing certain medical hazards, the last fifty years of progress have raised new and baffling questions. Not long ago, Dr. W. G. Smillie,[4] of New York City, speaking before the Boston Tuberculosis Association, said that it was wise to consider the future and at mid-century to attempt to visualize the problems in medical care that now were taking shape on the horizon. He predicted that the decline in deaths from major acute infections of all types, including tuberculosis, would continue; not only would the death rate from these diseases decline but also their prevalence in the community would diminish. To offset this there would be an increase in the degenerative diseases of all kinds: heart disease, neoplastic disease and diseases like diabetes and arthritis in particular.* And as a corollary, there would be a marked increase in senility and other mental diseases occurring in an aging population. Finally, because of the increased urbanization of the population there would be an increase in health problems relating to industry and in accidents and in other hazards of communal living.

The medical profession of today is well aware of the trends that Dr. Smillie mentioned. Certainly the word "geriatrics" — a word coined in 1914 by Dr. I. L. Nescher, the first author of any recent book on the subject — has come into general use, and countless elderly people are trying to keep young, are consulting doctors about how not to grow old too rapidly and, which is more important, are creating a socioeconomic problem of considerable magnitude. It is much better, in the long run, for the elderly to keep well, active and happy than to be regarded as useless and almost extravagant liabilities. How to accomplish this is a challenging question.

The cancer problem is another in which the public is vitally interested. Only a few years ago the establishment of cancer diagnostic centers in various parts of Massachusetts was considered a radical departure unlikely to accomplish much good. Now, such clinics flourish and will continue to be useful so long as the early recognition of malignant tumors offers the best hope for cure.

The specialty of industrial medicine is a relatively new one. The care of workers, however, the recognition and prevention of illnesses that come to them as the result of their occupations, and the prevention of accidents that may occur while they are at work is taking the full time of an increasing number of physicians each year. And certainly the number of nonindustrial accidents that occur in the course of a year is appalling — especially because their mortality rate is so high. An elderly cynic of my acquaintance pretends to claim that the invention of the internal combustion engine, with resultant destruction of peace, quietness and quiet places, has been one of the patently retrogressive steps of the past fifty years — a point of view that may be worth remembering. I have no idea how he may feel about the invention of the cyclotron.

The urbanization of the population, which seems to be on the increase in New England, is also causing new problems in medical care; certainly, from the viewpoint of organization, how best to develop diagnostic and therapeutic facilities so that they can be used most advantageously by everyone is a difficult question to solve. Apartment dwellers rather than householders are growing into a race, and nowadays the home care of any invalid is a heavy burden. There seems to be a need for better opportunities for diagnosis and for the care for all sorts of illness — acute illness, chronic illness, juvenile illness, geriatric illness, mental illness and for patients about to have babies as well as for patients who are too well to occupy a bed in a hos-

*Dr. Means, in the address to which I have already alluded, states that in 1912 the average age of adult patients in the public wards of the Massachusetts General Hospital was thirty-five. In 1949 the average age was sixty years. "Gone largely are the young people with acute infectious diseases. Instead our wards are now full of older people with degenerative diseases — arteriosclerosis, heart disease, arthritis, cancer, and because a considerable number of persons substitute alcohol for food, cirrhosis of the liver is frequently encountered."

pital for acute illness, who are not chronically ill but are too sick to be adequately cared for at home.

To my mind, also, there is need for a clearer definition of health; people must be taught to live happily so that they can enjoy health and so that they can use properly the opportunities for well rounded living that are now at their disposal. Preventive medicine has accomplished so much in the last fifty years as to offer hope that during the next fifty years preventive psychiatry may come into its own and develop methods for controlling mental disease in a manner comparable to the way in which so many diseases of infectious origin are now dominated.

The last fifty years must have been as exciting a period in which to live as any other half century in the nation's history. Progress has been made among many lines and in many ways. Here I have attempted merely to glimpse at certain aspects of the progress of medicine during these years and at the same time to mention some of the new problems that have been created by the very speed at which progress has been accomplished.

It seems a pity that human nature appears to be so constituted that ingenuity, originality and inventiveness tend to overshadow behavior. With a profound sense of humility, and even of sadness, I find that in spite of the progress in medicine that has taken place recently, the opening sentence of the leading article in the first number of the *Boston Medical and Surgical Journal* for the new century carries the same ominous weight in 1951 as it did in 1901, fifty years ago: "In these uncertain and turbulent times when the peace balance of foreign relations has reached so high a degree of sensitiveness as to be disturbed and upset by a breath; when war clouds start up most unexpectedly and from the most unlooked-for quarters of the globe, and chase each other in rapid succession, the study of military surgery claims a much larger share of the attention of the medical student than ever before."

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

Weekly Clinicopathological Exercises

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

BENJAMIN CASTLEMAN, M.D., *Associate Editor*

VIRGINIA W. TOWNE, *Assistant Editor*

CASE 37011

PRESENTATION OF CASE

First admission. A fifty-one-year-old man was admitted to the hospital complaining of a painless, progressively enlarging tumor of the right testicle.

The mass was noted approximately six months previously and had gradually and steadily increased in size. There had been a 13-pound weight loss in this period.

Twelve years previously the left testicle had been removed for a tumor. In the same year a duodenal ulcer was demonstrated. He had remained on a diet since that time and had not had any further trouble from this. He had dyspnea after climbing one flight of stairs, but there were no other constitutional symptoms.

On physical examination there were wheezes and musical rales at the right apex. An 8 by 6 cm., irregular, ovoid, hard, nontender mass replaced the right testicle. The spermatic cord was normal. There were enlarged lymph nodes in both axillas, but no other palpable superficial nodes.

The temperature was 98°F., the pulse 80, and the respirations 20. The blood pressure was 110 systolic, 70 diastolic.

Urinalysis was normal. Examination of the blood revealed a hemoglobin of 13.8 gm. and a white-cell count of 11,300, with 78 per cent neutrophils, 15 per cent lymphocytes, 6 per cent monocytes and 1 per cent eosinophils. The nonprotein nitrogen was 21 mg. per 100 cc. X-ray films of the chest showed an irregular, stringy density, with calcification in both apexes within which were mottled radiolucent areas. Both lungs disclosed considerable emphysema. An intravenous pyelogram showed no abnormality except for slight tortuosity of both ureters and small indentations of the left ureter at the junction of the upper and middle thirds.

On the third day a right inguinal orchiectomy was performed, and on the sixth postoperative day after an uneventful convalescence the patient was discharged from the hospital.

The pathological report on the specimen was seminoma of the testicle, and a review of the sections from the left testicle removed twelve years previously showed the histologic picture of the two tumors to be similar.

Final admission (fourteen months later). Following discharge the patient received a course of x-ray therapy to the area of lymphatic drainage. He received an estimated tumor dose of approximately 2500 r, given over a two-month period. During the course of this therapy the duodenal ulcer was activated but responded readily to treatment. Intravenous pyelograms made following the completion of x-ray therapy showed the irregularities on the upper left ureter observed at the previous examination to be no longer present.

Six months prior to admission he developed severe, sharp, lower lumbar pain following a "twisting" lift that was successfully treated by strapping and heat. Subsequently, he had two similar attacks, each brought on by lifting. The pain, which did not radiate from the back, was of sufficient severity to necessitate several days' bed rest. Between the attacks there was no discomfort. Five days prior to admission he developed a severe low back pain while turning over in bed. This persisted in spite of bed rest and was accompanied by chills.

His appetite had been poorer than usual for the five days prior to admission, and the stools had been clay colored.

Physical examination showed a pale, dehydrated, flushed man. The beard was thin, the axillary and pubic hair sparse, and the phallus small. There was some decrease in breath sounds and vocal fremitus in the left chest. There was tenderness in the right upper quadrant and a sensation of a mass in the area of the right renal pedicle. The testes were absent, and the operative scars and inguinal regions were normal. There was marked restriction of all motion at the lumbosacral joint, with tenderness of the spinous process of the fourth lumbar vertebra. The left ankle jerk was depressed.

The temperature was 103°F., the pulse 100, and the respirations 20.

X-ray films of the spine showed extensive demineralization of all the bones with anterior wedging of the bodies of the eighth, eleventh and twelfth dorsal vertebras (Fig. 1). There was protrusion of the intervertebral disks into the bodies of the fourth and fifth lumbar vertebras and compression fractures of the fourth lumbar and eighth and eleventh dorsal vertebras. An x-ray film of the chest showed no change from the previous films.

The urine had a specific gravity of 1.008, gave a + test for albumin and contained urobilinogen in 1:15 dilution and no Bence-Jones protein. Examination of the blood disclosed a hemoglobin of 13 gm. and a white-cell count of 5000, with 80 per cent neutrophils, 12 per cent lymphocytes and 6 per cent monocytes. The nonprotein nitrogen was 20 mg., the total protein 6.2 gm., the serum calcium 8.4 mg., the phosphorus 3.5 mg., the phosphatase 3.5 units and the van den Bergh less than 0.2 mg. direct and 0.3 mg. total per 100 cc. The prothrombin time was 24 seconds (normal, 17 seconds), and the sedimentation rate 3 mm. in fifteen minutes and 25 mm. in sixty minutes. The bromsulfalein test showed 11 per cent retention (photo method). A blood Widal test and agglutination tests for brucellosis, heterophil antigens and Weil's disease were negative, as were blood, urine and stool cultures. A stool specimen was green and gave a +++ guaiac reaction. A sputum examination was negative for acid-fast bacilli. A Congo-red test resulted in 80 per cent retention in the serum. Total calcium excretion in a twenty-four-hour urine specimen was 48 mg. with a volume of 2400 cc. The test for FSH (follicle-stimulating hormone) was positive for 96 and 192 mouse units per twenty-four hours. The blood Hinton test was negative.

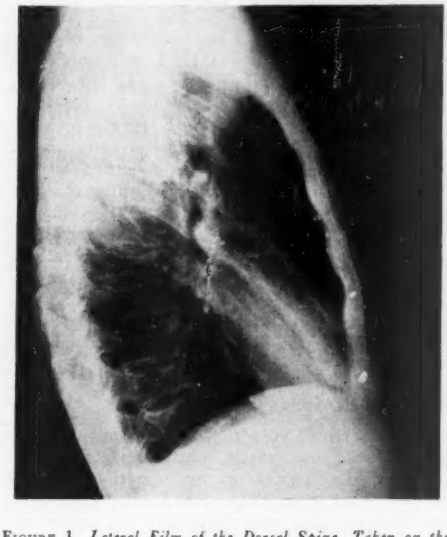

FIGURE 1. *Lateral Film of the Dorsal Spine, Taken on the Final Admission.*

All the bones are demineralized. The bodies of the eighth, eleventh and twelfth dorsal vertebras are compressed.

The patient was placed on aureomycin and penicillin. However, the temperature remained elevated in the vicinity of 101°F., with a pulse rate of 100 to 110. The pain in the back gradually disappeared. He appeared alert and bright enough except that after a week tremulousness and shaking developed. There were no neurologic signs and the chest appeared clear clinically. A lumbar puncture showed normal dynamics and a clear spinal fluid

with normal chemical findings and no cells. A skin test for brucellosis and a tuberculin test (0.1 cc. in 1:10,000 dilution) were negative. An x-ray of the chest showed a strand-like increase in density present in the anterior segment of the right upper lobe, with numerous strand-like increases in density in the basal segments of the lower lobes. Finely calcified densities were present in both apexes, and there was a suggestion of a small amount of fluid in the right costophrenic sinus. The white-cell count was 6600, with 95 per cent neutrophils, 5 per cent lymphocytes and 5 per cent monocytes.

Aureomycin was discontinued on the eighth hospital day, and chloramphenicol and later streptomycin were substituted. He continued to have a temperature up to 102 to 103°F., a pulse rate between 120 and 130 and a respiratory rate of 30 to 40. The blood sodium was 126.1 milliequiv., the chloride 88 milliequiv., the potassium 4.2 milliequiv., and the carbon dioxide 25.3 milliequiv. per liter. An electrocardiogram was normal. On the fifteenth hospital day Precortin, 2 mg. daily intramuscularly, was begun. He gradually passed into a sleepy, semicomatose state but was still rational. The white-cell count was 11,700, and the eosinophil count 0. Distinct, moist rales and expiratory wheezes were heard throughout both lungs and breathing was labored. By the twentieth day the urinary output was far below the intake, and a trace of sacral edema was evident. The course was steadily downhill, death occurring on the twenty-second hospital day.

Differential Diagnosis

Dr. Joseph C. Aub*: "An intravenous pyelogram showed . . . small indentations of the left ureter at the junction of the upper and middle thirds." That is very important because it suggests that lymph nodes were displacing the ureter and that the tumor had metastasized.

"Tests for FSH were positive for 96 mouse units and 192 mouse units per twenty-four hours." Much information could be obtained from that test if it were done properly, but to have stopped at 192 mouse units indicates only that this man was castrated, which I already know. If gonadotropins had been done and a positive quantitative Aschheim-Zondek test[1] found, that would have been interesting, but the record fails me. What was the blood pressure?

Dr. Benjamin Castleman: It was 100 to 110 systolic, 60 to 70 diastolic.

Dr. Aub: The pressures were not low. He was not in shock.

Was a sugar determination done?

Dr. Castleman: The sugar on the cerebrospinal fluid was 74 mg. per 100 cc. There was no blood sugar recorded.

*Physician, Massachusetts General Hospital.

Dr. Aub: May I look at the x-ray films now? The x-ray picture looks like tuberculosis, does it not?

Dr. James J. McCort: It looks very much like it.

The films of the intravenous pyelograms, which were taken after the patient's admission with a testicular tumor, show good excretion of the dye bilaterally and a pressure defect on the medial aspect of the left ureter just below the kidney pelvis. Opposite the bodies of the third and fourth lumbar vertebras the left ureter is displaced laterally, and this is considered to be presumptive evidence of metastases to the lymph nodes of the para-aortic chain. On the chest film taken at the same time nodular densities with a flecky calcification are seen in both apexes, and also in these segments are a few radiolucent areas, which can represent small cavities or ectatic bronchi. Both lungs are emphysematous, and the diaphragm is flat. The heart and vessels are not abnormal except for tortuosity of the aorta.

At the completion of the x-ray treatment, the lateral displacement of the left ureter is no longer seen. In the interval of two months a 2500-r tumor dose had been administered to the suspected para-aortic lymph nodes. In the same interval there had been no change in the appearance of the chest.

An examination of the gastrointestinal tract performed while he was receiving x-ray therapy shows the rugal folds in the prepyloric area of the stomach to be somewhat prominent although this area of the stomach was not rigid. The duodenal cap was constricted and contained a small crater. The changes suggest a probable antral gastritis and an active duodenal ulcer. There is a fleck of calcification in the left upper quadrant that I am unable to identify. It could be within the adrenal or within the pancreas.

The intravenous pyelogram taken at the last admission, fourteen months after the excision of the testicular tumor, reveals that the dye is excreted promptly and in fair concentration by both kidneys. There is no lateral displacement of the kidneys or ureters to indicate a possible recurrence in the para-aortic lymph nodes.

Dr. Aub: Are the kidneys normal?

Dr. McCort: They are normal in size. There may be slight diminution in excretion on both sides.

In the chest film taken just before death, the mottled calcified densities at the apexes are again noted. At this time a slight strand-like density is seen in what appears to be the superior segment of the right lower lobe. A few strands of increased density are also seen in the basal segments of the lower lobes. I think the changes in the apexes represent a chronic fibrocaseous tuberculosis with small areas of calcification.

Dr. Aub: The diagnosis that I was going to make does not fit very well with these x-ray findings. I think this is a difficult case — chiefly because I did

not realize that seminomas went to bone. I expected to find an infection around the kidney due to obstruction of a ureter. I had also expected to find a great deal of seminoma in the lungs, which does not seem to have been present.

Could I see the x-ray films of the spine?

DR. MCCORT: The spine is well shown on the films of the chest and the pyelogram. The bodies of the eighth and eleventh dorsal vertebras are partially collapsed, and all the vertebral bodies are demineralized. There is no actual destruction of bone (Fig.1).

DR. AUB: And the lumbar vertebras?

DR. MCCORT: The bones are likewise demineralized. There is slight compression of the body of the fourth lumbar vertebra.

DR. AUB: I am completely befuddled. I have to find an infection somewhere in this man that killed him. Why did he have a high temperature which did not respond to anything and with which he died? He probably did have tuberculosis and he may have had miliary tuberculosis, but I do not have evidence to make the diagnosis. There is the possibility of tuberculosis in the adrenal, but it does not seem to me like a very adequate diagnosis.

Another condition that he may have had is multiple myeloma. He did not have anything to suggest multiple myeloma except the lesion in the bone and the testis. Multiple myeloma can appear first in the testis. This patient could not very well have had a multiple myeloma in the testis that was removed and did not recur for twelve years. Such a long delay before anything showed up in the bones seems unlikely to me. A famous scientist a number of years ago had a testicular tumor that was multiple myeloma, but he had a great many plasma cells in the blood. This man had no plasma cells, no Bence-Jones protein and a normal total protein. I do not see how I can make a diagnosis of multiple myeloma.

He may have had Addison's disease, which obviously was thought of on the ward because he was given DOCA. He had a low sodium, a low chloride, a low phosphatase, a normal phosphorus and a normal potassium. He retained water, but only after receiving DOCA, and he also had gastrointestinal symptoms. In addition, there may have been a mild renal insufficiency. All these findings are consistent with a diagnosis of a mild Addison's disease.

The patient had both his testes removed so that he may have had Albright's postmenopausal osteoporosis. As one looks at the x-ray films, that is about what the bone changes look like. That may well have been the answer to this part of the problem.

It is known that he had a seminoma that had already metastasized. A fair percentage of patients with seminoma do extremely well on x-ray therapy, but I do not think this man did particularly well. A mass was felt around the renal pedicle that I should think was a metastasis. I had expected to find metastases in the lungs, but I cannot make that diagnosis. There are translucent areas in the x-ray films of the chest that one could ascribe to tuberculosis. The densities in both apexes look like chronic tuberculosis. I do not see any justification for saying that this was seminoma although he may have had scattered throughout the lungs little fibrous bands of seminoma from a lymphatic spread of the disease. There is inadequate evidence for this. The reason I am stuttering around is because I am trying to find some reason for the fever. Waterhouse–Friderichsen disease is a possibility, but he had the fever too long. He may have had a seminoma in the adrenal and an adrenal insufficiency, but I do not think the evidence for it is adequate. I had thought he had an occluded kidney with pus, or a perinephric abscess; I cannot make that diagnosis if the pyelogram is correct.

Therefore, I would make a diagnosis of a metastatic disseminating seminoma, probably in the liver, sufficiently enlarged in the central portion to be necrotic and infected. I think tumor lesions probably were found in the bone, although I never heard of it before. What about the blood in the feces? He possibly had a bleeding gastric ulcer for which he had a certain amount of evidence, but one might say that this was due to seminomas through the gastrointestinal tract, some of which were necrotic and bleeding. I suspect you all think this is a very weak diagnosis. I certainly think so, but I do not know what else to make.

DR. J. H. MEANS: I wonder whether the lapse into coma was connected with any cerebral metastatic disease.

DR. AUB: Seminoma does go to the brain frequently. That is a good idea — around the temperature center.

DR. MEANS: That is what I had in mind.

DR. ALFRED KRANES: I would lean a little more toward a tremendous infection, probably miliary tuberculosis, but there is no real evidence in favor of it.

DR. JOSEPH S. BARR: Two weeks ago, out at West Roxbury Veterans Hospital, I saw a patient with seminoma with metastases to the upper end of the femur — the first one that I had ever seen.

DR. FLETCHER H. COLBY: We were just as puzzled as Dr. Aub has been. Most of us came to the same conclusion that he did: that the most logical diagnosis was one of disseminated seminoma. We believed that, with all the laboratory work and studies that had been done, we had completely eliminated all the more usual infectious diseases. We could not help believing during the last illness that a great deal of the disease that he had must have been in the chest because he had a great deal of difficulty in breathing, with signs in the chest, and required an oxygen tent.

DR. JACOB LERMAN: I should like to ask Dr. Aub if he would discuss the hormone secretion of the tumor.

DR. AUB: Dr. Nathanson[1] has summarized that very briefly in the last book on carcinoma published by the Massachusetts branch of the American Cancer Society, and Twombly[2] wrote a very good article about it in 1942. Seminomas may secrete hormones or may not. Some malignant ones do not. Mostly, they secrete chorionic gonadotropin, characteristic of pregnancy, that may be missed in the laboratory test although it ought not to be. They also secrete too much pituitary gonadotropin sometimes, but in this patient the test was not carried out beyond the point at which it might be due to castration. One could not be sure that the excess pituitary gonadotropin was not due to castration because these patients continue to secrete that after the primary tumor is removed. It helps if it is positive, but not if it is negative. If it is very high, that is not too good a sign for prognosis, for it means that the patient will be dead soon.

CLINICAL DIAGNOSES

Diffuse carcinomatosis.
Bronchopneumonia.
Malnutrition.

DR. AUB'S DIAGNOSIS

Metastatic disseminating seminoma.

ANATOMICAL DIAGNOSES

Tuberculosis of vertebras, kidneys, liver and adrenal (left), active.
Paravertebral abscess, eleventh thoracic vertebra, small.
Bronchopneumonia, resolving and organizing, upper lobes.
Gastric ulcers, chronic, healing.
Operative scars: orchiectomy for seminoma, bilateral.

PATHOLOGICAL DISCUSSION

DR. CASTLEMAN: At autopsy we found no evidence anywhere in the body of seminoma. We looked in the retroperitoneal region, where there should have been a node, and there was none. Whether there had been lymph nodes there before that had perhaps been destroyed by the radiation, I do not know. The retroperitoneal space seemed to be in very good condition. The lungs did show old tuberculosis at both apexes and numerous small miliary lesions that in the gross we thought certainly were miliary tubercles. Microscopical section disclosed that they were merely areas of pneumonia with a lot of granulation tissue — some of them in small bronchioles, a bronchiolitis perhaps. It was evident that something had been going on for the period of the last admission, but there were no epithelioid cells or anything that we could call active tuberculosis. On the other hand an examination of a bronchial lymph node demonstrated two active tubercles. The liver showed numerous tubercles, some with caseation, as did the kidneys, but no evidence of tuberculosis of the ureter to account for the change in the x-ray films. The left adrenal was completely caseous, but the right was normal. I do not believe we can account for the Addisonian picture on the basis of one destroyed adrenal.

The spine was the most interesting aspect of the case. The twelfth thoracic vertebra was completely destroyed by tuberculosis, and there was also involvement of the eleventh. This had produced a little narrowing of the intervertebral disk, but the disk itself was not involved. The seventh, ninth and tenth thoracic vertebras were perfectly normal, but the eighth thoracic vertebra was destroyed by the disease. We found a tuberculous abscess outside these vertebras, but the vertebras in the lumbar region were not involved with tuberculosis as far as we could make out. I cannot explain the x-ray changes here. Although no definite active tuberculosis was found in the lung, there were calcified apical scars, which were probably the nidus of the original infection with hematogenous spread to the vertebras and terminally to the left adrenal, kidney and liver. The tuberculous process probably began in the twelfth vertebra and extended along the anterior vertebral ligament to involve the eleventh, skipped the ninth and tenth and penetrated to the eighth. This extension along the anterior surface without involvement of the intervertebral disks is quite characteristic of tuberculosis, as has been well described by Compere.[3] Involvement of the disk is a very late manifestation in tuberculosis and is not a direct extension from the vertebra, unlike pyogenic infections, in which the disk is less resistant to destruction. There were, as Dr. Aub predicted, several healing ulcers over the lesser curvature of the stomach.

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CASE 37012

PRESENTATION OF CASE

A forty-two-year-old man entered the hospital complaining of pain, swelling and bluish discoloration of the neck and shoulder.

Ten days before admission, when he was tuna fishing, it was necessary to brace his left shoulder and neck to steady the rod, and in doing this there was apparently a moderate degree of trauma to

the area. The next day he noted bluish discoloration, "like a bruise," in the same area, not associated with pain or redness. Five days before admission he had a questionable elevated temperature, and two days later he noted a dull, aching, constant pain in the left side of the neck that was increased by moving the head to the right. The pain gradually increased in severity but did not radiate. Two days before entry he noted three enlarged glands in the left neck, which became tender and seemed to increase in size; at the same time he noted dilated venules in the area, increasing difficulty in swallowing, slight hoarseness and dryness of the throat, and slight occipital headaches.

Generally, the patient had always enjoyed excellent health. He had been exposed to tuberculosis twenty years prior to entry but frequent x-ray films of the chest in the last year and a half before admission had been normal. He had a left orchiectomy fourteen years prior to entry at another hospital. The pathological report was papillary adenocarcinoma of the testis, with epididymis and cord free of tumor. This was associated with left inguinal adenopathy which subsided following operation. He had had a gonococcal infection twelve years previously, and although he had been symptom free, urethral sounds had been passed two to four times a year prophylactically. In the two to three years prior to entry he noted occasional slight, dull aching pain in the right shoulder radiating down the right arm.

Physical examination showed two small areas of contusion over the left shoulder. Dilated venules were noted over the infraclavicular area, supraclavicular fossa, anterior border of the left trapezius muscle and the upper epigastrium. The external jugular vein was nodular, beady, moderately tender and palpable to the supraclavicular fossa. There was questionable dilatation of the veins of the left arm and no dilatation of the veins of the face. Examination of the heart and lungs was negative. The liver was palpable at the costal margin but nontender. The left testicle was absent.

The temperature was 98.6°F., the pulse 90, and the respirations 20. The blood pressure was 100 systolic, 70 diastolic.

The urine was normal. Examination of the blood disclosed a hemoglobin of 15.8 gm. The nonprotein nitrogen was 16 mg., and the total protein 6.66 gm. per 100 cc. A blood Hinton test was negative. An electrocardiogram was reported to be within normal limits. An x-ray examination of the chest showed a soft-tissue prominence, smooth in outline and with no calcification in the anterosuperior mediastinum (Fig. 1). The trachea was displaced slightly to the right, and the esophagus slightly to the left. The mass did not pulsate or move with swallowing. The remainder of the chest was within normal limits. There was slight prominence of the left ventricle and slight tortuosity of the aorta. The venous pressure on the left was equivalent to 39 cm. and that on the right to 10 cm. of saline solution.

He was started on anticoagulant therapy, receiving 200 mg. of heparin on the first, third and sixth days, and 200 mg. of Dicumarol on the first day and 100 mg. on the fifth and tenth days. The clotting time on the fifth day was 9 minutes in the first tube and 22 minutes in the fifth tube, but otherwise the course was uneventful.

On the ninth day an operation was performed.

Differential Diagnosis

Dr. Oliver Cope*: May I first ask two questions, which may be answered from the record? In the first place in the history it says that the patient noted palpable glands in the neck, which suggests that the observer interpreted them to be glands, and in the physical examination there was no mention of glands in the left neck. Is there confusion over the beads in the vein?

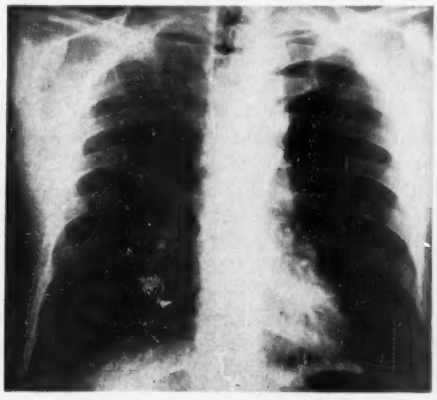

Figure 1. *X-Ray Film of the Chest.*
Arrow points to a smooth pressure defect on the left side of the trachea.

Dr. Benjamin Castleman: I believe so.

Dr. Cope: That would be very important. The only nodules that were found were those associated with the left external jugular vein?

Dr. Castleman: That is right.

Dr. Cope: Were the pulses and blood pressures taken on both arms? Surely, if the venous pressures on both arms were taken, the arterial flow must also have been examined.

Dr. Castleman: I find no evidence of it.

Dr. Cope: That is curious.

It seems that there was a mass in the anterior mediastinum somewhat to the left side that was associated with a block of the venous circulation

*Visiting surgeon, Massachusetts General Hospital.

and some thrombosis. I do not know the nature of the mass, but that is the problem.

Before I go farther, may I ask whether the esophagus was really pushed to the left or was it in its normal position? Misinterpretation of the position of the esophagus is an error that often appears in the record. The esophagus normally passes slightly to the left in the upper thoracic strait. It would be a peculiar mass to depress the trachea to the right and at the same time the esophagus to the left.

DR. JAMES J. MCCORT: To answer your questions, perhaps I had better describe the x-ray findings.

There is a soft-tissue density in the anterior superior mediastinum, and in the lateral film it is seen behind the manubrium. On fluoroscopic examination it did not pulsate and did not move upward when the patient swallowed. It is smooth in outline, and there is no calcification within it. On the grid film the smooth pressure defect on the left side of the trachea can be seen (Fig. 1). This had displaced the trachea slightly to the right side. In the superior mediastinum the trachea is slightly to the right of the midline, but in this patient it seems to be farther to the right than normal. This is probably the result of displacement by the soft-tissue mass.

DR. COPE: And indented!

DR. MCCORT: Yes; I agree.

DR. COPE: That is important evidence.

DR. MCCORT: The same thing can be said about the esophagus. The esophagus is always a little to the left of the midline in its upper portion, but here it is farther to the left than we usually see it. It seems to be indented on its right margin.

DR. COPE: The record suggests that the patient associated the trouble with tuna fishing. He braced himself in some way and pulled the left neck or shoulder, and that was followed by a transitory bout of fever. The dilated venules and the lump in the neck were perhaps present before he went fishing, but it was the tuna fishing that served to call them to his attention.

Why did the physicians give him the anticoagulant and chemotherapy? I believe that because of the coagulation that was palpable in the external jugular vein on the left side, they thought he was developing or might develop extensive thrombosis, which might lead to more extensive thrombosis and to pulmonary embolism. Perhaps they thought, with the onset of headache, that the pressure of the mass in this area was impairing the cerebral circulation. A mass in this area could block the venous return not only of the internal jugular vein directly from the brain but also of the vertebral vein. If both of those are limited, the venous return from the brain may be sufficiently impaired to cause a cerebral accident. Of course it is also possible that the physicians were worried about the arterial circulation to the brain.

I am going to discuss and dismiss a primary venous disease. Theoretically, pulling on the left shoulder might have started a phlebitis. The areas of venous dilatation over the left shoulder and of the epigastrium suggest that the left innominate vein was obstructed. I have never seen primary phlebitis involving the left innominate vein. Perhaps it occurs, but I am going to dismiss it. Also, this patient did not have any emboli in the lung visible on x-ray study and no history of it, and more important, the mass that was visible on x-ray examination must have been a very much firmer mass than the one that I would expect from a phlebitis. The indentation of the cartilaginous rings in the trachea indicates a hard, solid, tumor mass. This tumor mass was not limited to the left side. Undoubtedly, it not only was pressing upon the trachea, and occluding to some extent the left innominate vein, which would explain the physical findings, but also was pushing the esophagus over to the opposite side and therefore to some extent was a bilateral mass. A mass of lymph nodes could do that. The fact that it did not move on swallowing suggests that it was a mass that was not related to the thyroid. However, from the x-ray findings of a mass in the anterosuperior mediastinum with displacement of the esophagus in the neck, one would expect the mass to be thyroid.

DR. MCCORT: In the Radiology Department we were concerned with the possibility you mentioned. On the lateral film of the neck, however, the cervical portion of the trachea did not appear to be displaced.

DR. COPE: In a man of this age it would be unusual if some of the thyroid was not in the neck. In an older person one is more likely to find a mediastinal goiter that does not move on swallowing. With increasing age the attachment of the goiter to the larynx becomes more tenuous.

I am worried, of course, about the testicular carcinoma. Fourteen years apparently is a long time

to live following an adenocarcinoma of the testicle. I have had very limited experience with malignant lesions of the testicle, and so I am drawing on what the Urological Service tells me. Testicular tumors generally are of a high grade of malignancy, and the rule is that if the cancer is not entirely removed in the initial operation, the evidence of recurrence is usually prompt. There was no note about whether or not this man received any x-ray therapy — radiation should have improved the prognosis somewhat. But fourteen years is a very long time to go without having a recurrence. He should have been cured by the orchiectomy, or he should have had a recurrence much earlier. It is possible that the mass was a mass of lymph nodes — the Virchow lymph-node group, the tail-end lymph nodes in the thoracic duct. Dr. Fletcher H. Colby tells me that a reasonable number of all the patients with testicular tumors — 6 per cent of the Massachusetts General Hospital series — are initally found to have a metastatic lymph node in this area. There is usually a prompt spread via the thoracic duct through the lymphatics up to these terminal lymph nodes. It is a far cry in terms of time to suggest that this mass was metastatic from the old testicular lesion, but I do not believe it can be excluded.

Thymoma is another tumor that could do this. The thymus lies wholly in the anterior mediastinum so that a thymoma, although it can displace the trachea, certainly would not displace the esophagus. It is very unlikely that it was a tumor of the parathyroid because such a tumor does not ordinarily reach this size and would not be expected to give bilateral compression.

In spite of the fact that the mass was fixed and did not move on swallowing, the only way I can put an anterior and a posterior tumor and a bilateral tumor together with any reasonableness is to say that it was a thyroid tumor. Whether the tumor was malignant or not I do not know. The signs that the patient had were those of venous obstruction of the innominate vein. But I suppose he may also have had a vocal-cord paralysis. He had noticed hoarseness. Was the left recurrent laryngeal nerve involved? It might have been because the recurrent nerve on the left side passes in front of the aorta, under the aortic arch, and comes up close to the trachea; it can be pressed in any one of these positions. The hoarseness could have been due to the venous obstruction equally well, with some edema of the larynx. The laryngologist, if he did not find the cord paralysis, probably found edema, if the hoarseness was real.

In conclusion, I would say that this was a thyroid tumor. Although it could have been malignant the chances are that it was a nodular goiter and nonmalignant, chiefly on a statistical basis. There is a 7 per cent chance that it was malignant and a 93 per cent chance that it was nonmalignant. That is as far as I can go.

Dr. J. H. Means: Do you think he may have had a hemorrhage into a cyst in this goiter during the fishing episode? Most of these intrathoracic goiters are cystic. Dr. Castleman had one that on gross examination was almost indistinguishable from a congenital polycystic kidney. This is not a suggested diagnosis because I am sure it is not to be considered; I merely mention it for window dressing. Historically, it is interesting that during the discussion of the differential diagnosis of a mediastinal tumor aneurysm was not mentioned. That was one of the first things we should have thought of thirty years ago.

Dr. Cope: I had dismissed aneurysm from my mind for two reasons — first because the radiologist saw no pulsation. Lack of pulsation is not the most valid reason; it is asking too much of the radiologist. I dismissed aneurysm more on the fact that the mass was bilateral.

Dr. Means: You can dismiss it on the fact that they are never seen any more.

Dr. Robert R. Linton: I do not agree with you Dr. Means; I see a good many of them.

Dr. Cope: I am glad Dr. Means brought up aneurysm. Only nine years ago Dr. Albright and I made a diagnosis of hyperparathyroidism in a patient with a mass in the left side in this very region. We were all so intent on the bone disease and the mild, moderate abnormality of calcium metabolism that we went ahead, operating with a diagnosis of parathyroid tumor; it was an aneurysm.

Dr. Linton, because of his interest in vascular disease, sees them far more often than I do. They are nonetheless the endocrine surgeon's bugaboo. I might mention that I have almost made that same mistake on two other occasions that I can recall in the last twelve years.

A Physician: Is there any indication that venous thrombosis points more toward a malignant than a nonmalignant thyroid tumor?

DR. COPE: I cannot say. In my limited experience there has not been a difference. The thrombosis seems to be a pressure phenomenon.

DR. LINTON: I would go a little farther than that. How often have you seen thrombosis of the innominate vein in thyroid disease of any kind? That one consideration made me discard the diagnosis of intrathoracic goiter. I have never seen it.

A PHYSICIAN: Perhaps Dr. McCort could answer that since he has written an article[1] on it.

DR. MCCORT: In the group of cases of intrathoracic goiter that I have reviewed, none of the 28 patients had venous thrombosis.

DR. COPE: Obviously, Dr. Linton's point is a sound one.

DR. CASTLEMAN: Dr. Linton, would you tell us your preoperative findings?

DR. LINTON: The preoperative diagnosis was a tumor in the upper anterior mediastinum. I was still uncertain in my own mind whether it was an aneurysm, and therefore I had on the operative table the necessary instruments to wire an aneurysm if one were found. The angiogram did not give us very much aid, chiefly, I think, because the mass was so dense. It did show some displacement of the superior mediastinum. Of course, we seriously considered the testicular tumor. Although we thought, as Dr. Cope did, that fourteen years was a long time before a recurrence or evidence of metastatic disease, we could not rule it out completely either.

Before I forget it, there was one other thing in the history that bothered me. One of the chief complaints was nausea, a symptom that I have not seen in either a thoracic aneurysm or a goiter.

CLINICAL DIAGNOSIS

Mediastinal tumor.

DR. COPE'S DIAGNOSIS

Nodular goiter, nonmalignant.

ANATOMICAL DIAGNOSIS

Metastatic teratoma of mediastinal lymph nodes from testis removed fourteen years previously.

PATHOLOGICAL DISCUSSION

DR. LINTON: We opened the left chest and found a very widespread tumor involving the upper mediastinum, with the innominate vein coursing right through it. We had hoped that we would be able to do a thrombectomy to remove the cause of the occlusion, which obviously was embarrassing the circulation of the left arm, but this was out of the question. All we could do was remove a specimen for biopsy. The vagus nerve also coursed right over it; I think that perhaps explained the nausea because the patient still had the same complaint following operation.

DR. COPE: Could you tell grossly whether the mass was in lymphoid tissue, a secondary or a primary tumor?

DR. LINTON: I could not tell grossly. It was just one solid mass of infiltrating tumor. We thought it was related to the testicular tumor. It seemed the best explanation.

DR. CASTLEMAN: The biopsy showed a glandular teratoid tumor, with numerous giant cells of the Langhans type, which are not too uncommonly seen in testicular tumors. We were able to get a slide of the testicular tumor that had been removed fourteen years before, and the findings were quite similar. This may be called a teratoma or a teratoid carcinoma. Dr. Robert E. Scully,[2] who is now a member of the staff of our laboratory, looked up a series of cases when he was at the Peter Bent Brigham Hospital; he found 1 patient who developed lung metastases nine years after removal of the testicular teratoma. Perhaps our case of a fourteen-year hiatus may be the longest on record. I am fairly confident that it was a metastasis from the testicular tumor. It is surprising that it had skipped the groin and gone all the way up to the mediastinum, but apparently that does occur, as Dr. Colby suggested, in a certain percentage of cases.

We have requested an Aschheim-Zondek test, which has not yet been reported.* It would be interesting to know whether that is positive now. The patient will probably receive x-ray treatment.

DR. LINTON: I think he will. It was hoped he might respond to some hormonal treatment. We have asked for a consultation in that regard.

DR. ALFRED KRANES: How radiosensitive are these tumors?

DR. CASTLEMAN: Not very. I think the ones that do respond are seminomas.

*The Aschheim–Zondek test was positive for 8 and 40 mouse units.

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2. Scully, R. E., and Parkam, A. R. Testicular tumors. I. Seminoma and teratoma. *Arch. Path.* 45:581-607, 1948.

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HALF CENTURY OF PROGRESS

In a world that is somewhat topsy-turvy, where wrong is often made to masquerade as right and where upside down is expected to appear as right-side up, it is wise, as a seasick passenger tries to fix the eye on something stationary, to try to fix the mind on something permanent. Time can perhaps fill this requirement of permanence as well as anything, for while time seems to flow past the traveler like the road beneath his wheels, everyone knows that it is really a changeless screen and that it is only life and other conventional and shadowy material that move across it.

Starting with such an unarguable premise it becomes perfectly obvious that the first year of time was the year 1 — and during it the Garden of Eden must have been a very cozy place — and that the first century finished its cycle after a hundred years of time, with the ending of the year 100.

Carefully transferring the same method of computation to the Christian Era it is again apparent that the first century A.D. came to its close on December 31, 100, at midnight, and that the turbulent twentieth century began, not with the dawn of 1900, as commonly and erroneously reckoned, but with that of 1901, and that its first half concluded with the final hours of the year 1950, and good riddance to them!

The editors of the *Journal*, then, with logical propriety, have selected the current month and, indeed, this very week in which to launch the series of articles on fifty years of medical progress that has been long awaited and long in preparation.

It is their New Year offering to the readers of the *Journal*, this series of accounts, prepared with the utmost fidelity by a group of distinguished authors, recapitulating the progress that has been made in medicine against the background of an authentically established half century.

For certainly many things have happened to benefit mankind in this period of fifty years, and not the least have taken place in the domain of medicine, both preventive and therapeutic. The sad lack has been in any apparent human capacity to distribute and appreciate and use wisely the contents of this horn of plenty. Much of the knowledge is available by which man can learn to live with his environment and with himself, but few will listen.

When the open hostilities of World War II came to a close in 1945 the warning verse, "Turn back, O man, forswear thy foolish ways," was presented for consideration, but the advice seems not to have been heeded. What will the second half of the century bring — a new concept of forbearance and dignity in man's relations to man, or the rejection of everything constructive that has been built up over the ages?

RESEARCH AND COMMUNITY SERVICE AT THE HARVARD SCHOOL OF PUBLIC HEALTH

The function of the faculty of a school of public health is that of medical leaders everywhere, the threefold aim of teaching, practice and research, the principal objective being prevention rather than cure. The contemporary scope of these activities at the Harvard School of Public Health is

indicated in the Dean's *Annual Report*[1] for 1949. No mere recitation of statistics about students and courses and finances, this account of his stewardship by General James S. Simmons is a personalized dynamic story in which photographs are used more often than tables, and with telling effect.

Teaching, of course, is the main job of a faculty and is the topic of first concern in the *Report*. During the past decade the number of courses offered at the Harvard School of Public Health has increased from 37 to 87, and within the past two years the curriculum and methods of pedagogy have been subjected to searching review, as previously reported in the *Journal*.[2] However, substantial portions of the *Report* for 1949 are devoted to the functions of community service and research.

A few specific instances serve to illustrate what is meant by the term "community service." During the year 1948-1949, General Simmons was a delegate to the World Health Assembly, Dr. Hugh R. Leavell journeyed to England to assess British Health Services, and Dr. Mark Hegsted spent three months in Bogota, Colombia, helping national health authorities establish an institute of nutrition. Dr. William H. Forbes spent the months of February through May studying health problems of Indian workers in a jute mill in Chengail, India. Dr. Franz Goldmann served as a consultant in public health in Germany and studied medical-care programs in the Scandinavian countries. Drs. L. S. Snegireff and T. H. Ingalls made cancer surveys for the arsenic and carbon-black industries, respectively, and Dr. Edward Murray administered the medical service of a hospital in Twillingate, Newfoundland, for one of the summer months. Such field experiences are of value and almost indispensable in maintaining the balance of practice and research that goes to round out and infuse life into teaching.

The account of investigative activity for the year 1948-1949 reflects a maintenance of the leadership assumed by American universities since the days when the only hallmark of postgraduate education was a degree from an ancient European seat of learning. The ills of human beings may be grouped arbitrarily into four major categories of communicable infections, noncommunicable diseases, neoplasms and results of violence; the fields of research at the Harvard School of Public Health correspond. A single example from each field is mentioned here, since it is not the number of diseases being studied that is so impressive as the number of points at which they are being approached. In poliomyelitis, for example, some members of the faculty are engaged in studying methods of cultivating the virus on isolated human tissues; others work to identify the mechanism of active immunization in suckling mice by antibodies transmitted through milk; and a third group is improving the technic of artificial respiration by electrical stimulation of the phrenic nerve. The important new field of congenital anomalies is being actively investigated by coordinated case study and epidemiologic and experimental methods in the departments of Epidemiology, Nutrition, and Maternal and Child Health. The carcinogenic properties of industrial dusts have been the subject of two field investigations of industry. The concerted disciplines of the industrial hygienist, epidemiologist and biostatistician are brought to bear on the problem. Studies of the causes of trauma both in war and in peace have produced a pattern for the field study of accidents as a preventable condition. Prevalence and incidence studies in aeronautical, motor-vehicle and home activities are being made and analyzed, and the various personal and material factors involved in the genesis of accidents evaluated.

The document is both the blueprint of an educational institution and the expression of a new concept of health. Public health today is revealed as no mere matter of sewage systems, inoculations and reporting of children's diseases. The most significant trend for the year 1949 is toward a holistic, ecologic approach to the problem of preventing disease and an assumption of responsibility for dealing with many of the pressing realities of the atomic age. To bring this about, a perceptible reorientation, a resynthesis of public-health teaching, practice and research, is taking place. The great minds of yesteryear, the Darwins, Pasteurs, Kochs, Snows and Shattucks, have a counterpart in the group mind.

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1. Harvard School of Public Health. *Annual Report, 1948-1949*. 111 pp. Cambridge: Harvard University Press, 1950.
2. Editorial. Masters of industrial health. *New Eng. J. Med.* **241**: 626, 1949.

AN END AND A BEGINNING

Soon after the death in 1947 of Dr. Robert N. Nye, then editor of the *Journal*, a small research fund was established in his memory. This fund, during the course of its practically complete expenditure, has had the unique distinction of providing the means for initiating and carrying through to its conclusion a small but complete and singularly useful investigation.

The problem selected for this study, which was conducted at the Massachusetts General Hospital, was the protection of personnel engaged in roentgenology and radiology. The preliminary report describing a film badge that measures the quantity and quality of scattered radiation was published in the *Journal* on July 21, 1949, and the final report appears elsewhere in this issue.

The study thus concluded has perforce omitted an investigation of the long-time effects of radiation on the peripheral blood picture of the exposed worker, because all available personnel are now adequately protected as a result of the first part of the research.

Film-badge monitoring, with its various tangible benefits as described in the original paper, is the real and precise contribution of this investigation. The mere wearing of the badge has resulted in greater caution on the part of personnel, in view of the newer knowledge revealed that scattered radiation is "harder" than the original beam. Equally important have been the technical improvements made in setting up x-ray apparatus with a view to the greatest possible protection of workers.

The monitoring of personnel engaged in handling radium needles has also disclosed a "harder" radiation than is demonstrated by the standards. This change in gamma radiation has been shown to be a result of filtration, and is now regarded as evidence that the radium worker is actually using lead filtration for protection.

The group investigated gave no indication of any effect of radiation on the leukocytes.

Now that the value of film-badge monitoring has been so clearly demonstrated, the next logical step is to fix the responsibility of seeing that it is done. Few hospitals and radiologists in private practice have the facilities for installing this protective device, and at least as important is the fact that employees in a number of trades and industries are exposed to radiation as an occupational hazard. The potential dangers in the retail shoe trade, for instance, have already been described in these pages, as referred to by Hunter and Robbins.

It seems logical that such an application of preventive medicine should fall in the domain of organized public health. The end of a specific research problem points unmistakably in this case to the beginning of a new public-health program.

EMERGENCY ORDERS

On January 18 there will appear in the *Journal* an article by Bradford and Currier, co-chairmen of the Committee on Emergency Medical Service of the Massachusetts Medical Society, presenting in careful detail a program for the medical aspects of civil defense in time of disaster.

Unfortunately, such a plan, admirable as it is, requires time in which to become reasonably effective. Liaisons must be made, personnel must be selected and trained, and stock piles of needed materials must be collected and stored in the most available places that are still reasonably safe from destruction.

In the meantime, aware of the fact that they who hesitate are often lost, Dr. Vlado A. Getting, commissioner of public health and head of the medical department of the Massachusetts Civil Defense Agency, and Dr. Charles G. Hayden, chief of the hospital and medical division of the medical department of civil defense, have issued emergency orders for all doctors, nurses and hospitals in the State to be followed in the event of a "major catastrophe." These orders, under the title "Interim Plans for Civil Defense" appear in the Massachusetts Department of Public Health column elsewhere in this issue of the *Journal*.

The instructions for personnel, the best that can be improvised on such short notice, represent the very essence of simplicity: all unassigned health workers, in case of emergency, are to report to the nearest hospital there to do the best they can with the materials available.

Since no man knows what doctors other than the fellows of the Massachusetts Medical Society may

be available in the State for emergency service, the Council having again refrained from recommending the periodic registration of physicians, a period of voluntary registration will shortly be proclaimed, during which all categories of health personnel will be asked to register through their local civil-defense organizations.

Drs. Getting and Hayden are to be commended for making the best of the present situation. The citizens of the Commonwealth can rest assured that in their capable hands order will emerge from a somewhat confused situation as rapidly as is humanly possible.

Mr. Gliddon, it is said, proposes to give a new series of Archaeological lectures in Philadelphia. He intends to unroll two mummies, and anticipates "curious and valuable developments."

Boston M. & S. J., *January 1, 1851*

MASSACHUSETTS MEDICAL SOCIETY

DEATHS

GARNEAU — Benoit W. Garneau, M.D., of Fall River, died on November 27. He was in his fifty-fifth year.

Dr. Garneau received his degree from Laval University Faculty of Medicine in 1920. He was a member of the Board of Health and formerly school physician and visiting physician at the Fall River Tuberculosis Sanatorium.

His widow, his mother, a son and two brothers survive.

MACE — Charles H. Mace, M.D., of West Springfield, died on December 10. He was in his eightieth year.

Dr. Mace received his degree from Baltimore Medical College in 1900. He was formerly medical examiner for Hampshire County, chairman of the West Springfield Board of Health and school physician and was an associate member of the staff of Springfield Hospital.

A daughter, two sons, two grandchildren, a sister and a brother survive.

WHITE — Franklin W. White, M.D., of Boston, died on December 19. He was in his eighty-second year.

Dr. White received his degree from Harvard Medical School in 1895. He was formerly a member of the faculty of Harvard Medical School, consulting physician at the Boston City Hospital, president of the American Gastro-Enterological Association and secretary and chairman of the Section of Gastro-Enterology of the American Medical Association, and was a member of the Association of American Physicians, American Roentgen Ray Society and New England Roentgen Ray Society and a fellow of the American College of Physicians and American Medical Association.

A daughter, a son and four grandchildren survive.

BOSTON MEDICAL LIBRARY

RECENT ACCESSIONS OF HISTORICAL INTEREST

Fleming, Sir Alexander. *Pacific Broadcast on Penicillin, August 1945.* (Facsimile copy). The reproduction is made from the original handwritten manuscript of Dr. Fleming. The Library is indebted to a good friend for this valuable unpublished document. The manuscript contains many references to Dr. Fleming's visit to America, and it constitutes a history of the discovery of penicillin.

Middlesex East District Medical Society. 1850-1950. Centennial Volume. (Melrose, Massachusetts, 1950.) This district society of the Massachusetts Medical Society, in commemoration of its one-hundredth anniversary, has issued a history of the Society and of medicine in its territory.

Rucker, C. Wilbur, and Keys, Thomas E. *The Atlases of Ophthalmology, 1850-1950.* This pamphlet is a catalogue of the exhibit prepared for the San Francisco meeting of the American Medical Association, held in June, 1950. The exhibit was arranged in commemoration of the centennial of the invention of the ophthalmoscope by Helmholtz.

Steno, Nicolaus. *Discours de Monsieur Stenon sur l'anatomie du cerveau. Paris, 1669.* (Facsimile edition, Copenhagen, 1950.) The Universitets Medicinsk-Historiske Museum in Copenhagen has made a valuable contribution to medical history in the issuance of this classic monograph. The English edition (London, 1733) is also included. The introduction is a brief biography of Steno and an account of his scientific work. The small volume is a beautiful example of fine publishing.

National Institutes of Health, Bethesda, Maryland. *Collected Reprints for 1948.* (Four volumes with author index, 1950.) For the convenience of interested persons, the seven health institutes of the Government have brought together in one place the large number of articles published in various periodicals. It is proposed to continue the series.

NOTES FROM THE MEDICAL EXAMINER*

THE VALUE OF TRACE EVIDENCE

In medicolegal investigations even exceedingly small particles of biologic material may have immense value. In a recent case, 45 mg. of dried milk curds was the only evidence available to corroborate

*Presented by the Department of Legal Medicine, Harvard Medical School.

the unusual story of a mother suspected of infanticide and the illegal transportation of her dead baby.

A securely wrapped cardboard box was found one morning on a city dump. A curious workman was startled to discover that it contained a human infant wrapped in a blanket and clad in a blood-stained cotton shirt and diapers. The identity of the child was quickly established from the name of a small rural hospital printed on the shirt. A woman had delivered an illegitimate, normal, full-term baby ten months previously and had left the hospital against advice six hours post partum.

The mother was located and conceded that it was the body of her son. She insisted that she had given the healthy child on the day of birth to a couple with a nine-month-old child of their own for temporary custody and that she had not seen him alive since. She said further that the man and woman, living in a neighboring state, had telephoned her about five days later to say that the infant was dead. The mother claimed that she had received the body from them, wrapped it as it was later found and locked it in a dry attic for ten months prior to discarding it on the dump. The foster couple admitted knowing the mother, but emphatically denied that they had ever had custody of the infant or even known of its existence. Neither the infant's mother nor the couple would change their stories.

The body was mummified and partially decomposed. It measured 42 cm. in length, weighed 1220 gm. and yet appeared to be a full-term infant (Fig.1).

FIGURE 1. *Appearance of the Infant on Examination.*

The skin was shriveled, leathery and brown black. Numerous colonies of fungi were scattered over the surface. The features were distorted and flattened. There was a small amount of dried, dark brown matter resembling old blood between the eyelids and in the nares. The umbilical cord measured 5 cm. in length and was doubly ligated with umbilical tape. The portion of the cord distal to the ligature was shriveled and dark brown, and the proximal portion was pale yellow and also desiccated.

The viscera were shrunken, dried and so matted together that identification of individual organs was difficult. The stomach contained a few gray-white particles resembling dried milk curds. Injuries, diseases or anomalies were not discovered on complete dissection or on x-ray examination. The cause of death was not determined. It was believed that the dried, blood-like material on the face and shirt represented post-mortem putrefactive discharge. It was estimated from the appearance of the umbilical cord that the infant was at least one day and almost certainly not more than seven days of age. Medical evidence by itself was insufficient to determine the date of death inside the broad limits of a few weeks to several years.

The gray-white particles were removed from the stomach. Together they weighed 45 mg. The results of the analysis of these for calcium and phosphorus, together with pertinent normal values for human and whole cow's milk are listed in Table 1. It may be seen that the percentage of calcium,

TABLE 1. *Analysis of Stomach Contents for Calcium and Phosphorus.**

SUBSTANCE TESTED	ASH	ASH	CALCIUM	PHOSPHORUS	CALCIUM PHOSPHORUS RATIO
	PERCENTAGE OF DRY WEIGHT	MG. /100 CC. OF WHOLE MILK	PERCENTAGE OF ASH	PERCENTAGE OF ASH	
Human colostrum (1-12 days)	2.5	307	10.0	6.0	1.7
Human transitional milk (12-30 days)	1.8	241	12.0	8.0	1.5
Human mature milk (1-9 mo.)	1.7	206	16.0	8.0	2.0
Human late milk (10-20 mo.)	1.6	198	14.0	7.0	2.0
Cow's milk, whole, mature	5.5	550	17.0	14.0	1.21
Particles from stomach of infant	1.6	—	16.3	8.1	2.05

*Modified from Composition of milks (*Bull. National Research Council* No. 119, January, 1950) and from Holt, L. E., Courtney, A. M., and Fales, H. L. Theoretical study of women's milk, especially its inorganic constituents (*Am. J. Dis. Child,* **10**:229-248, 1915).

Values for evaporated, condensed, skim and dried skim cow's milk were not included because there was an even greater discrepancy from the values of the analysis.

phosphorus and ash and the calcium phosphorus ratio of the particles almost exactly fit the figures for mature or late human milk and differ considerably from those of human colostrum and human transitional and cow's milk. This remarkable coincidence provides strong medical evidence that the infant was fed mature human milk by a woman other than the mother. There are no human milk banks in the area. Needless to say, the figures by themselves scarcely constitute legal proof.

Finding the few milligrams of milk curds in the stomach enabled the conclusion that the infant had been born alive and supported the mother's claim that the baby had been placed in the custody of foster parents prior to death. Although the mother pleaded guilty to a charge of illegal transportation of a dead body, further criminal prosecution was not undertaken because of lack of evidence of both the cause of death and jurisdiction.

JOSEPH W. SPELMAN, M.D.
State Pathologist, Vermont Department of Health, Assistant Professor of Pathology and Lecturer in Medical Jurisprudence, University of Vermont College of Medicine.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

INTERIM PLANS FOR CIVIL DEFENSE

Emergency orders for all doctors, nurses and hospitals in the State to be followed in the event of a "major catastrophe" were issued jointly on December 19 by Dr. Vlado A. Getting, commissioner of public health and head of the medical department of the Massachusetts Civil Defense Agency, and Dr. Charles G. Hayden, chief of the hospital and medical division of the medical department of civil defense.

The instructions apply only until plans for the medical and health division have been completed and all doctors and health workers have been assigned by their local civil defense agency.

In the near future Governor Dever will proclaim a period of registration during which all categories of health personnel will be asked to register through their local civil defense organization.

The emergency orders are as follows:

PHYSICIANS, DENTISTS, NURSES AND OTHER HEALTH WORKERS

Report immediately to the hospital nearest your home for assignment if you have no previous assignment.

Owing to an anticipated large number of casualties, the simplest type of treatment must be employed. In burn cases, use ointment with a minimum amount of dressing. When supplies of bandages and all available linens that have been torn up are exhausted, use clean newspapers. For splinting fractures and other bone injuries, venetian-blind slats may be used.

With limited supplies of blood and blood substitutes, patients suffering from burns for whom these are not available should drink at least 1 quart of water a day containing one-half a teaspoonful of baking soda and 1 teaspoonful of salt.

HOSPITALS AND SANATORIUMS

Stockpile blood, blood fractions and sufficient containers and equipment for other blood-substitute fluids.

If finances permit, hospitals (and drug houses) should carry at least twice their normal inventory of supplies commonly used for civilian casualties. These include narcotics, sedatives, antibiotics and materials for treating accidents and burns.

Rotate supplies and store them in places where they are not likely to be damaged.

Mobilize and train volunteers to staff base hospitals and emergency casualty hospitals. Volunteers will be needed for nursing, maintenance services, canteen work and so forth.

Plan to convert all hospital domiciliary buildings for patient use by providing emergency housing in neighboring homes for hospital personnel.

Develop plans for evacuation of patients. Determine in advance which patients can be sent home and which should be moved to a new site.

Submit a list of proposed emergency hospital sites to the medical department of the Civil Defense Agency.

Plan substitute utilities so that the hospital can operate in the event that its present facilities are knocked out.

Arrange for staffing the hospital with skeleton casualty treatment teams so that remaining staff members may be released for duty in emergency hospitals.

CORRESPONDENCE

VACANCIES AT BEDFORD AIR BASE

To the Editor: Recently, General Thomas R. Goethals wrote a letter advising physicians to become attached to a reserve unit and thus to have some control over their assignment. This advice is the result of considerable study and experience.

In giving this advice General Goethals assumed that the men have some knowledge of service life. Obviously, all the men have not seen service and cannot appreciate how sound his caution is.

There are not many vacancies in such units that a young man can fill. However, there are seven vacancies at Bedford Air Base. Three of these call for flying, with the extra pay. There is an opportunity for a surgeon and for a doctor certified in internal medicine.

Meetings are one week end a month, for which three or four days' pay are received.

The steps necessary are to obtain a commission in the Air Force Reserve and apply to the Eighty-Ninth Troop Carrier Wing.

I am available the third week end of each month at the Air Base.

ROBERT M. HOLLAND
Lt. Col. USAFR

West Roxbury, Massachusetts

NOT A PRECEDENT

To the Editor: In connection with a brief editorial concerning Yale's "precedent" in testing the apprentice system, which appeared in the July 6 issue of the *Journal*, I should like to call attention to the following information:

For at least fifteen years the University of Wisconsin Medical School has been utilizing the preceptorship method of teaching senior medical students. The senior year is divided into four quarters of three months' duration. Each student spends three months, separated completely from the medical school, as an assistant to a carefully selected practicing physician who is an extramural member of the medical faculty. The student's experiences vary depending upon whether he works with a doctor who practices in a rural community of 1000 people or with a busy general surgeon in an industrial city of 100,000.

Most of the students find this a most exciting, illuminating, maturing experience.

ROBERT F. SCHILLING, M.D.
Thorndike Memorial Laboratory
Boston City Hospital

NOTE: The use of the word "precedent" was unfortunate; the apprentice system in one form or another has, of course, been in use since before the days of the medical school on Cos.

Those modern schools that are reviving it are to be congratulated on their wisdom. — ED.

BOOK RECEIVED

The receipt of the following book is acknowledged, and this listing must be regarded as a sufficient return for the courtesy of the sender. Books that appear to be of particular interest will be reviewed as space permits. Additional information in regard to all listed books will be gladly furnished on request.

Liver Injury: Transactions of the eighth conference April 28 and 29, 1949, New York, New York. Edited by F. W. Hoffbauer, M.D., Department of Medicine, University of Minnesota Medical School, Minneapolis. 8°, paper, 163 pp. New York: Josiah Macy, Jr., Foundation, 1950. $1.60.

Nineteen physicians participated in this eighth conference on liver injury. The subjects discussed included the liver lobule, the function of the hepatic artery, massive liver cirrhosis, the role of the liver and kidney in circulatory homeostasis, liver glycogen and the protection of liver cells, and dietary cirrhosis. This volume is another in the well known series of conferences sponsored by the Josiah Macy, Jr., Foundation.

NOTICES

BOSTON CHAPTER OF AMERICAN FEDERATION FOR CLINICAL RESEARCH

A meeting of the Boston Chapter of the American Federation for Clinical Research will be held at the New England Medical Center on Monday, January 8, at 8 p.m.

PROGRAM

Postoperative Changes in Serum Alkaline Phosphatase. A. B. French, A. L. Bengle, C. M. Jones and H. K. Beecher, of the Massachusetts General Hospital.

Salivary Sodium Potassium Ratio in Varying States of Adrenocortical Activity. Thomas F. Frawley, of the Peter Bent Brigham Hospital.

ACTH and Plasma Proteins. P. Bernfeld and F. Homburger, of the New England Medical Center.

Re-evaluation of the Reliability of Pharmacologic and Cold-Pressor Studies in Hypertension and Pheochromocytoma. Hyman J. Rubitsky, James A. Evans, Carl C. Bartels and Elmer C. Bartels, of the Lahey Clinic.

Relation between Valve Area and Symptoms in Mitral Stenosis. Benjamin M. Lewis, Richar Gorlin and Florence W. Haynes, of the Peter Bent Brigham Hospital.

SUFFOLK DISTRICT MEDICAL SOCIETY

A meeting of the Suffolk District Medical Society will be held at the Chelsea Naval Hospital on January 29 at 8:30 p.m. The subject to be discussed is "Mass Casualties."

SPRINGFIELD HOSPITAL

The educational program of the Springfield Hospital for the month of January is as follows:

Saturday, January 6.
9-10 a.m. Grand Surgical Rounds.
10-11 a.m. Radiology Conference (topic to be announced) in the Staff Conference Room. Dr. John W. Turner.
11-12 noon. Combined Medical-Surgical Grand Rounds in the Staff Conference Room.

Thursday, January 11.
12:15 p.m. Staff Meeting in the Staff Room.

Saturday, January 13.
9-10 a.m. Grand Surgical Rounds.
10-11 a.m. Seminar on Surgical Principles, Fourth Session, in the Staff Conference Room on the subject "Hernia, Incisional, Direct, Indirect, Femoral and Umbilical." Dr. Omar Pace.
11-12 noon. Clinicopathological Conference in the Staff Conference Room.

Tuesday, January 16.
8:30 p.m. Guest Speaker Conference (topic to be announced) in the Staff Conference Room. Charles A. Janeway, M.D., pediatrician, Childrens' Hospital, Boston, and Thomas Morgan Rotch Professor of Pediatrics, Harvard Medical School.

Saturday, January 20.
9-10 a.m. Grand Surgical Rounds.
10-11 a.m. Pathology Conference in the Staff Conference Room on the subject "Diseases of the Male Urinary Tract." Dr. William Kaufmann.
11-12 noon. Medical-Death Review in the Staff Conference Room.

Saturday, January 27.
9-10 a.m. Grand Surgical Rounds.
10-11 a.m. Seminar on Surgical Principles, Fifth Session, in the Staff Conference Room on the subject "Appendicitis, Meckel's Diverticulum, Small Intestine." Dr. James Scola.
11-12 noon. Surgical-Death Review in the Staff Conference Room.

SPRINGFIELD ACADEMY OF MEDICINE

A meeting of the Springfield Academy of Medicine will be held in the Woman's Club Building, 43 Spring Street, on January 9 at 8:30 p.m. Dr. Irving S. Wright, professor of medicine at Cornell University Medical College, will speak on the subject "A Critical Evaluation of the Present-Day Treatment of Peripheral Vascular Diseases."

NEW ENGLAND CARDIOVASCULAR SOCIETY

A meeting of the New England Cardiovascular Society will be presented by the Boston City Hospital at New England Mutual Hall, 225 Clarendon Street, Boston, on Monday, January 15, at 8:00 p.m., Dr. Laurence B. Ellis presiding.

PROGRAM

Audible Auricular Heart Sounds in Auricular Flutter. Drs. John P. Rattigan, William Byrnes, and Henry Kraus.

Observations on the Treatment of Patients with Severe Hypertensive Disease and Good Renal Function. Drs. Herbert S. Sise and Kenneth Chesky.

The Clinical Course of Mitral Stenosis, with Particular Reference to the Selection of Patients for Operation. Dr. Laurence B. Ellis and associates.

Effects of Ouabain on the Circulation in Mitral Stenosis. Dr. Richard A. Bloomfield and associates.

A Clinical Study of Intravenous Procaine Amide (Pronestyl): Its value and hazards. Drs. Norman S. Stearns and Edmund J. Callahan, III.

Interested physicians and medical students are cordially invited to attend. (*Please note place of meeting.*)

THOMAS WILLIAM SALMON LECTURES

The Thomas William Salmon Lectures will be given in Hosack Hall, New York Academy of Medicine, on Tuesday, Wednesday and Thursday, January 9, 10 and 11.

John Farquhar Fulton, M.D., Sterling Professor of Physiology, Yale University School of Medicine, will deliver the lectures, the general subject being "The Frontal Lobes and Affective Behavior: A study in psychosomatic interrelations."

NATIONAL CONFERENCE ON MEDICAL SERVICES

The twenty-fourth annual meeting of the National Conference on Medical Services will be held in the Red Lacquer room of the Palmer House, Chicago, on Sunday, February 11. The meeting is of special importance to presidents, secretaries, and public-relations personnel of state and county medical societies.

MISSISSIPPI VALLEY MEDICAL SOCIETY 1951 ESSAY CONTEST

The eleventh annual essay contest of the Mississippi Valley Medical Society will be held in 1951. The Society will offer a cash prize of $100, a gold medal and a certificate of award for the best unpublished essay on any subject of general medical interest (including medical economics and education) and practical value to the general practitioner of medicine. Certificates of merit may also be granted to the physicians whose essays are rated second and third best. Contestants must be members of the American Medical Association who are residents and citizens of the United States. The winner will be invited to present his contribution before the Sixteenth Annual Meeting of the Mississippi Valley Medical Society to be held in Peoria, Illinois, September 19, 20 and 21, 1951, the Society reserving the exclusive right first to publish the essay in its official publication — the *Mississippi Valley Medical Journal* (incorporating the *Radiologic Review*). All contributions shall be typewritten in English in manuscript form, submitted in five copies, not to exceed 5000 words, and must be received not later than May 1, 1951. The winning essays in the 1950 contest will appear in the January 1951 issue of the *Mississippi Valley Medical Journal*.

Further details may be obtained from Harold Swanberg, M.D., Secretary, Mississippi Valley Medical Society, 209-224 W. C. U. Building, Quincy, Illinois.

TREATMENT OF VETERANS AT GOVERNMENT EXPENSE

Fee basis physicians are reminded that the Medical Division of the Veterans Administration cannot issue authorization for treatment of veterans at Government expense, in cases of emergency, unless the Division is notified by the doctor within fifteen days of the date of treatment. Nonemergency treatments must be requested in advance of treatment. Treatment of veterans hospitalized in private hospitals for emergency conditions cannot be authorized at Government expense from the date of admission unless the Veterans Administration is notified within 72 hours. Notification subsequent to the 72-hour limitation can be authorized only from date of notification.

Treatment for nonservice-connected conditions cannot be authorized in private hospitals even though the conditions are emergency.

Delays in the transmittal of mail cannot be recognized in granting authorizations received after the lapse of deadlines. Telephone notification, with confirmation in writing, is the ideal method.

UNIVERSITY OF ILLINOIS GRADUATE COLLEGE FELLOWSHIPS

Ten fellowships supported by the Graduate College of the University of Illinois will be awarded to qualified scholars who contemplate academic careers in the medical and allied sciences, registration for work toward M.S. or Ph.D. degrees being required. Stipends of $1800 to $2400 are available for medical and dental graduates with a maximum of $3000 for unusually well qualified applicants. Pharmacy graduates receive a $1200 stipend for the calendar year. Exemption from tuition fees is provided for all appointees. Applicants need not have completed clinical internships. Minimum requirements are: bachelor's and M.D. degree; bachelor's and D.D.S. degree; bachelor's in pharmacy and M.S. degree.

Applications must be received by *February 15*, with selections to be announced by *April 1, 1951*. Forms may be obtained from the Associate Dean of the Graduate College, University of Illinois, 808 South Wood Street, Chicago 12, Illinois.

LABORATORY COURSES AT COMMUNICABLE DISEASE CENTER, CHAMBLEE, GEORGIA

A schedule of laboratory training courses will be offered at the Communicable Disease Center, United States Public Health Service, Atlanta, Georgia, from January 1 to December 31. Application forms and further information regarding the subjects, duration and location of the various courses may be obtained from the Officer in Charge, Laboratory Training Services, Communicable Disease Center, United States Public Health Service, P. O. Box 185, Chamblee, Georgia.

SOCIETY MEETINGS AND CONFERENCES

JANUARY 6. Massachusetts Society of Anesthesiologists. Page 1018, issue of December 21.

JANUARY 6–27. Springfield Hospital. Page 37.

JANUARY 8. Boston Chapter of American Federation for Clinical Research. Page 37.

JANUARY 9. Springfield Academy of Medicine. Page 1018, issue of December 21.

JANUARY 9. Massachusetts Society of Anesthesiologists. Page 1018, issue of December 21.

JANUARY 9. Harvard Medical Society. Page 1066, issue of December 28.

JANUARY 9. Springfield Academy of Medicine. Page 37.

JANUARY 9. Boston City Hospital House Officers' Association. Page 1066, issue of December 28.

JANUARY 9–11. Thomas William Salmon Lectures. Notice above.

JANUARY 11. The Diagnosis and Therapy of Lesions Producing Gastrointestinal Hemorrhage. Dr. Claude Welch. Pentucket Association of Physicians, 8:30 p.m. Haverhill.

JANUARY 15. New England Cardiovascular Society. Page 37.

JANUARY 17. Boston City Hospital House Officers' Association. Page 1066, issue of December 28.

JANUARY 17. New England Pediatric Society. Page 1066, issue of December 28.

JANUARY 19 AND 20. National Research Council, Committee on Human Reproduction. Page 1066, issue of December 28.

JANUARY 22. Boston Lying-in Hospital Obstetric Round-Table Conference. Page 629, issue of October 19.

JANUARY 23. Norfolk District Medical Society. Page 629, issue of October 19.

JANUARY 29. Suffolk District Medical Society. Page 37.

JANUARY 31. American Academy of Orthopaedic Surgery (see Kappa Delta Award for Research in Orthopedic Surgery). Page 736, issue of May 4.

FEBRUARY 9. Beta Iota Chapter of Nu Sigma Nu. Page 1018, issue of December 21.

FEBRUARY 11. National Conference on Medical Services. Notice above.

FEBRUARY 13. New England Society of Anesthesiologists. Page 512, issue of September 28.

FEBRUARY 21. Bay State Society for the Crippled and Handicapped. Page 1066, issue of December 28.

FEBRUARY 27. Norfolk District Medical Society. Page 629, issue of October 19.

MARCH 5–8. New Orleans Graduate Medical Assembly. Page 1018, issue of December 21.

MARCH 7. Hampshire District Medical Society. Page 170, issue of July 27.

MARCH 26. Boston Lying-in Hospital Obstetric Round-Table Conference. Page 629, issue of October 19.

MARCH 27. Norfolk District Medical Society. Page 629, issue of October 19.

APRIL 9–13. American College of Physicians. Page 296, issue of June 15.

APRIL 10. New England Society of Anesthesiologists. Page 512, issue of September 28.

APRIL 24. Norfolk District Medical Society. Page 629, issue of October 19.

MAY 8. New England Society of Anesthesiologists. Page 512, issue of September 28.

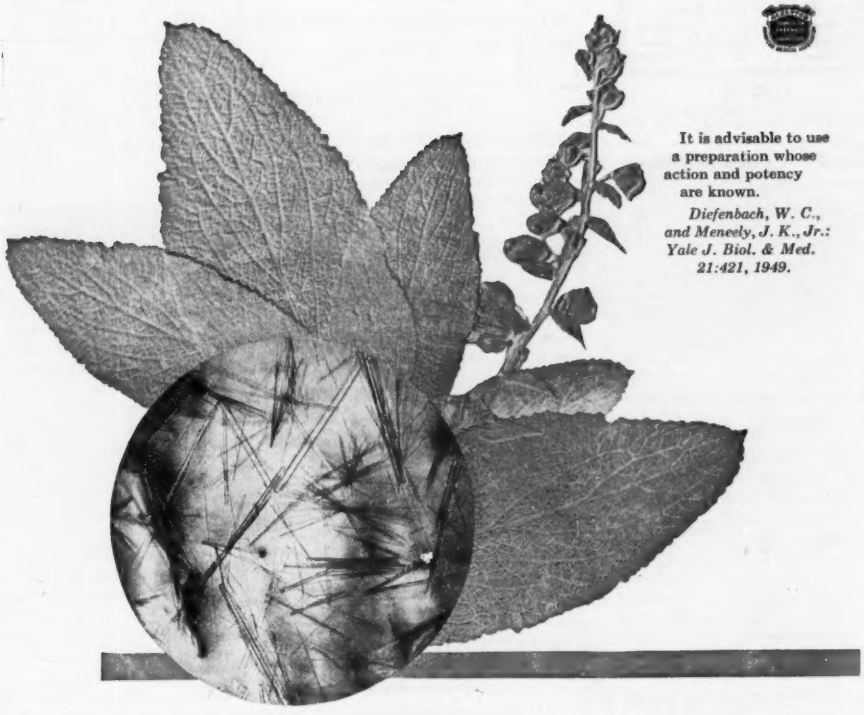
MAY 9. Norfolk District Medical Society. Page 629, issue of October 19.

MAY 22–24. Massachusetts Medical Society. Annual Meeting. Hotel Statler, Boston.

MAY 24–26. American Goiter Association. Columbus, Ohio.

SEPTEMBER 19. American Medical Writers' Association. Page 1066, issue of December 28.

(*Notices concluded on page xiii*)



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Diefenbach, W. C., and Meneely, J. K., Jr.: Yale J. Biol. & Med. 21:421, 1949.

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PATHOLOGIST, 4½ years' training, desires assistantship in July, 1951. Address A391, *New Eng. J. Med.* 26-4t

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B308-18-oam-12t

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APPROVED ANESTHESIOLOGY RESIDENCY at Eastern Maine General Hospital, Bangor, Maine. Training in all phases of modern anesthesiology. 1- and 2-year appointments available July 1, 1951. Write Clement S. Dwyer, M.D., Department of Anesthesiology. B334-24-4t

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B321-20-tf

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POSTGRADUATE STUDY IN BRITAIN for U. S. A. and Canadian doctors and dental surgeons, contemplating visiting Britain in 1951 for postgraduate study in preparation for M.R.C.P. London or Edinburgh, F.R.C.S., and F.D.S. (Fellow in Dental Surgery), are invited to contact Dr. Julian Landman of London, Royal York Hotel, Toronto, in January, for the purpose of giving all requisite information. B343-26-2t

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*Pitt, C.K.: *The Art and Science of Artificial Infant Feeding, J.M. Asso. Ala. 19:101 (Oct.) 1949.*

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NOTICES (*Concluded from page 38*)

SEPTEMBER 19–21. Mississippi Valley Medical Society. Page 1066, issue of December 28.

OCTOBER 31. New England Obstetrical and Gynecological Society. Hotel Somerset, Boston.

NOVEMBER 10–21. Pan-Pacific Surgical Association. Page 680, issue of October 26.

JULY 8–11, 1952. Thirteenth British Congress of Obstetrics and Gynaecology. Page xv, issue of December 14.

DISTRICT MEDICAL SOCIETIES

HAMPSHIRE

MARCH 7. 4:30 p.m. Cooley-Dickinson Hospital, Northampton.
MAY 2. 4:30 p.m. Annual Meeting. Jones Library, Amherst.

NORFOLK

JANUARY 23.
FEBRUARY 27.
MARCH 27.
APRIL 24.
MAY 9. Annual Dinner.

All meetings except the Annual Dinner will be held at the Boston Medical Library, 8 Fenway, at 8:00 p.m.

SUFFOLK

JANUARY 29. 8:30 p.m. Chelsea Naval Hospital.

CALENDAR OF BOSTON DISTRICT FOR THE WEEK BEGINNING THURSDAY, JANUARY 11

THURSDAY, JANUARY 11

*9:00–10:00 a.m. Grand Rounds. Robert Breck Brigham Hospital.
*9:00–11:00 a.m. Medical Grand Rounds. Joseph H. Pratt Diagnostic Hospital.

FRIDAY, JANUARY 12

*9:00–10:00 a.m. Medical Conference. Joseph H. Pratt Diagnostic Hospital.
*9:00 a.m.–12:00 m. Combined Medical and Surgical Staff Rounds. Peter Bent Brigham Hospital.
*10:00 a.m. Surgical Clinic. South End Health Unit, 57 East Concord Street, Boston.
12:00 m.–1:00 p.m. Clinicopathological Conference (Boston Floating Hospital). Joseph H. Pratt Diagnostic Hospital.
*12:00 m–1:30 p.m. Surgical Pathological Conference. Joseph H. Pratt Diagnostic Hospital.
*1:30 p.m. Tumor Clinic. Out-Patient Department, Mount Auburn Hospital, Cambridge.
*2:00–4:00 p.m. Therapeutic Conference. Joseph H. Pratt Diagnostic Hospital.
*4:00–6:00 p.m. X-ray Conference. Joseph H. Pratt Diagnostic Hospital.

SATURDAY, JANUARY 13

*9:00–10:00 a.m. Surgical Grand Rounds. Joseph H. Pratt Diagnostic Hospital.

MONDAY, JANUARY 15

*11:30 a.m.–12:15 p.m. Clinical Conference. South End Health Unit, 57 East Concord Street, Boston. Dr. Cleaveland Floyd in charge.
*12:15–1:15 p.m. Clinicopathological Conference. Main Amphitheater, Peter Bent Brigham Hospital.
*8:00 p.m. New England Cardiovascular Society. New England Mutual Hall.

TUESDAY, JANUARY 16

*12:15–1:15 p.m. Clinicoroentgenological Conference. Peter Bent Brigham Hospital.
*1:30–2:30 p.m. Pediatric Rounds. Burnham Memorial Hospital for Children, Massachusetts General Hospital.

WEDNESDAY, JANUARY 17

*9:00–10:00 a.m. Pediatric Pathological Conference. Joseph H. Pratt Diagnostic Hospital.
*12:00 m. Medical Discussion. Margaret Jewett Hall, Mount Auburn Hospital, Cambridge.
*12:00 m.–1:00 p.m. Clinicopathological Conference. (Children's Medical Center.) Amphitheater, Peter Bent Brigham Hospital.

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0.34 mg. Folic Acid
2.5 gr. Ferrous Sulfate, Dried U.S.P.
2 mg. Thiamin Chloride (Vit. B_1)
2 mg. Riboflavin (Vit. B_2)
0.5 mg. Pyridoxine (Vit. B_6)
20 mg. Niacinamide
1.5 mg. Calcium Pantothenate
3.5 Liver Concentrate 1.20 with other B-complex factors from liver

$3.00 per Hundred **RETAIL PRICE** **$5.00 per Hundred**
Available to druggists through their wholesaler
Chester A. Baker Laboratories, Inc.
BOSTON, MASS.

A CROSS SECTION of FINE AMERICAN BUSINESS

	Approx. Market	Cost	Est. 1949 Income
30 shr. General Elec.	$35	$1,050	$60
30 shr. Union Carbide	34	1,020	60
10 shr. Atchison, T. & S. F.	80	800	80
25 shr. Cleveland Elec.	40	1,000	55
15 shr. Standard Oil, N. J.	61	915	60
Average yield 6.58%		$4,785	$315

Our advisory department suggested the above list. It appeared in this *Journal* on June 23, 1949.

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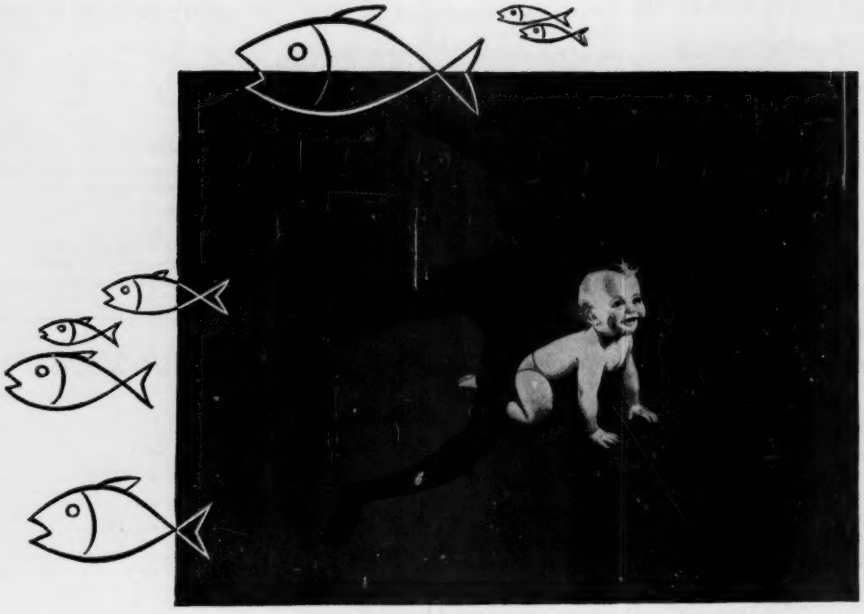

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removes the shadow of ***RICKETS***

Rickets may be found in apparently healthy and well nourished infants due to an insufficient intake of vitamin D plus inadequate exposure to ultraviolet rays.

It is now generally accepted that a vitamin D supplement should be given regularly not only to infants but to older children and adolescents. Mead's Oleum Percomorphum With Other Fish Liver Oils and Viosterol is useful for this purpose.

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1. Is a highly potent† source of natural vitamins A and D.
2. May be given in drop doses that are easily administered and well tolerated, and is supplied in capsule form also.
3. Has a background of sixteen years of successful clinical use.

†Potency: 60,000 U.S.P. units of vitamin A and 8500 U.S.P. units of vitamin D per gram. Each drop supplies 1250 units of vitamin A and 180 units of vitamin D; each capsule, 5000 units of vitamin A and 700 units of vitamin D.

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